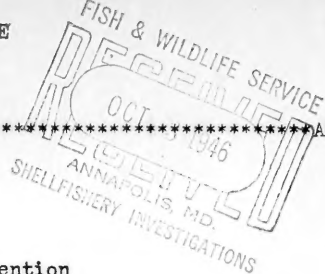


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ADDRESSES*****

Some Addresses

Given at

1946 Joint Annual Convention

Oyster Growers & Dealers Association of North America, Inc.

Oyster Institute of North America

National Shellfisheries Association

Hotel New Yorker, N. Y. C., June 5 - 7

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1946 Annual Joint Conference Oyster Groups

Hotel New Yorker, N. Y. C., June 5, 1946

Message from Honorable Julius A. Krug, Secretary, Department of Interior, Washington, D. C.

I regret that it is impossible for me to attend and address your convention. However, I want you to be assured of my interest in your industry and the success of the deliberations of this meeting.

I am familiar with the long history of successful operation of your industry under the guidance of its trade associations. You have been particularly fortunate to have had such an organization in the solving of your war-time problems. Actions unified through this organization will serve you equally well during, and after, your conversion to peace-time operations.

I have been especially interested in the advanced degree of planning your industry exercises in its operations. You improve growing areas, plant immature or seed oysters, and cultivate your crops. Because of these efforts, your industry produces much greater quantities of food than it would if your product was left unattended until harvest time. Many of you have applied your ingenuity and skill in improving the natural product and have succeeded in raising better, tastier, and more wholesome oysters. You have a right to look with pride on the successes that have made your brands famous throughout this and other countries.

I feel that your industry is in an excellent position to solve its problems of reconversion and adjustment through further modernization. It has been observed by this department in the past that when the demand for your products was lowest, those of you who were able to offer oysters of the highest quality, suffered little from these slack periods. More concentrated effort, therefore, should be directed towards improving the quality of shellfish through scientific cultivation, management of grounds, regulation of harvesting, and efficient handling and processing. This is a difficult task but the rewards are real. Not only do properly cultivated grounds yield three times the quantity obtained from uncultivated grounds, but the value of the harvest is six times as great.

You may be assured that the Department of the Interior, through the Fish and Wildlife Service, is happy to work with you in solving the technical and scientific problems that lead to the production of better sea foods, better management of the shellfish grounds, better conservation of the fishery resources, and wider markets for your products. I pledge you all possible assistance.

Hotel New Yorker, N. Y. C., June 5, 1946

THE FUTURE OF THE FISHERIES INDUSTRY

by Harden F. Taylor

By way of introductory remarks, after expressing my appreciation of the great honor your officers have done me in putting me in such a prominent place on your program, I must try to justify to myself the choice, even if I cannot justify it to you by a satisfactory performance in forecasting the future of this industry. To me, the opportunity to appear before so many old friends is itself sufficient justification; to you the only excuse I can find is in my association with the fisheries in assorted capacities---first in biological study, then technological and industrial research in government and industry, and finally a business responsibility, I am in a position of friendly detachment to take an appraising look at the fisheries as a whole.

If this is done in an orderly manner, the first thing is to size up what the fisheries have to offer, what kind of goods and how much. The waters to which we have access, especially the sea, are a vast factory and storehouse of many things other than food fish of value to man; the future will probably witness a far greater exploitation of these things than we have yet seen, but here and now our main concern is the fisheries as a source of food for man and animal in the United States.

Mankind everywhere consumes, and always has consumed, on the average, about 560 pounds dry weight of food, i.e., exclusive of the contained water, or close to 1800 pounds wet weight, as is, water included when purchased. These are "apparent" figures, i.e., the weights entering into commerce, not necessarily what is actually swallowed. Food consumption differs from time to time and place to place among different peoples, mainly in quality or nutritive content, not in quantity. In poor countries, and among poor people the intake of food tends to become what the nutritionists call a "peasant" diet, consisting mainly of vegetables and starches---rice, beans, potatoes, turnips and such, with a minimum of proteins and fats, especially animal fats. The reason for this is the inefficiency in the production of animal foods, for farm animals must consume during their lives several times their own weight of vegetable food. It is therefore much more economical for people in overcrowded countries to eat the vegetables themselves than to feed them to animals and then eat the animals. Yet, despite vegetarians, nutritionists assure us that a really high grade diet must contain amino acids that are found in inadequate quantity only in animal proteins. We have good reason to believe that fish generally contain these substances (though more analytical data are needed to prove the point absolutely). Sea fish, especially shellfish, contain in addition, a unique assortment of "trace" mineral elements that have been shown to be highly important. For these reasons, fish and seafoods, falling as they do in the class of the scarcest, most expensive and nutritionally necessary foods of animal origin, have an importance in world food economics which is disproportionately greater than their small quantity would indicate.

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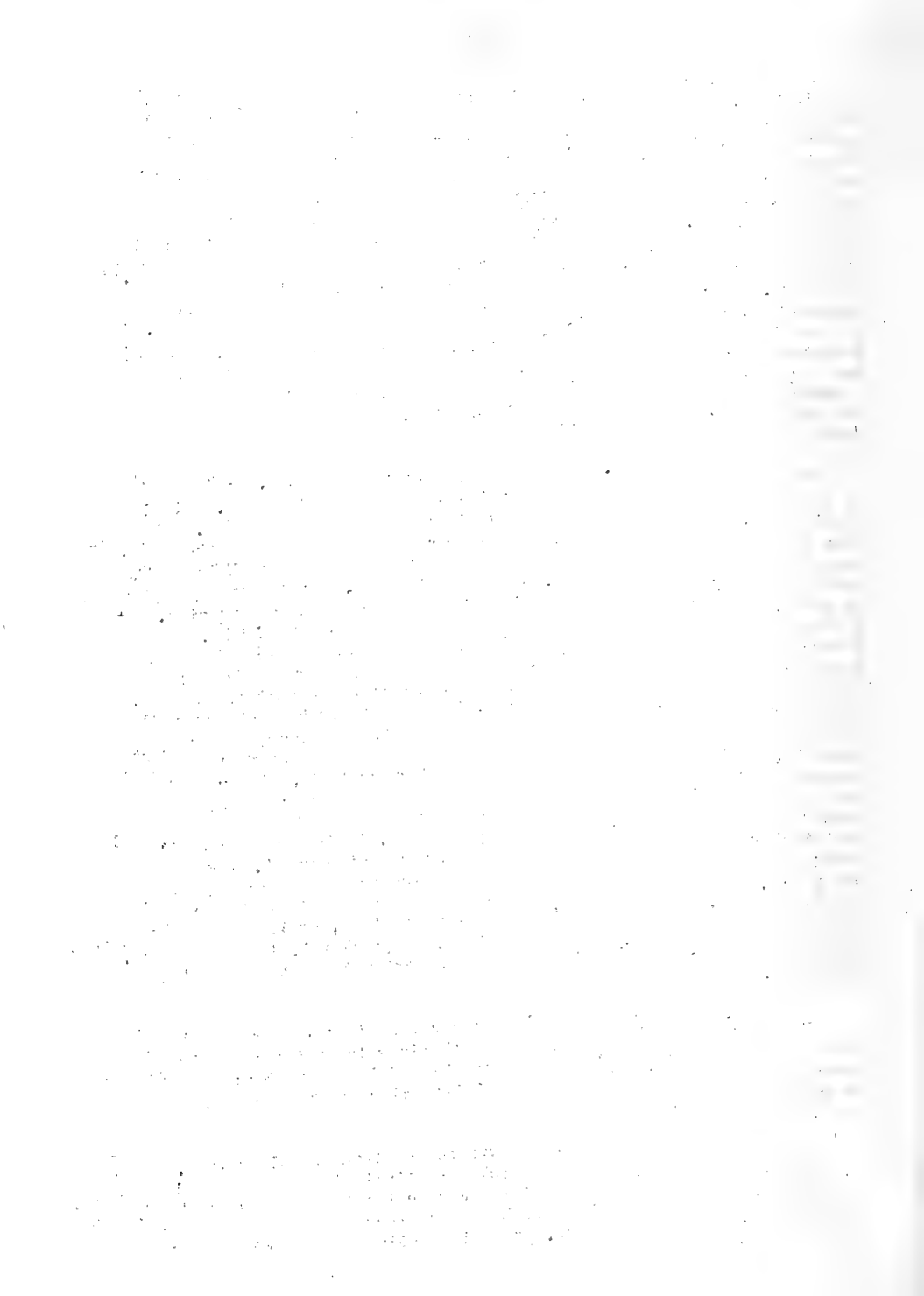
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From the business point of view it is possible to overestimate the health appeal. A few diet cranks will eat anything that they think is good for them, but most people eat and drink and smoke what they like whether it is good for them or not---or even when they know it is harmful. If the doctors tell them orange juice is good for them and they also like orange juice, the consumption will be heavy. But as for spinach---I do not like the stuff and will not eat it regardless of how good it is, or isn't. Where sea foods stand in this argument is difficult to say. Some items of sea foods---oysters, lobsters, clams, shrimp, soft shell crabs, sardines are gourmets' items---hors d'oeuvres and Smorgasbord,---but in the staple items everything depends on the delicate and fugitive quality of flavor. In honesty it must be said that the fish industry has not lived up to its opportunities in this regard, for statistics will show that over the years, the demand for fish has not increased particularly, nor have prices increased to the fisherman in proportion to the diminishing purchasing power of the dollar, as they would have done if fish were really a desired item.

Fish and sea foods are, at least in important instances, unrivalled by land animals in basic cost of production. As indicated above, animal flesh results from the conversion of vegetation by grazing animals. All farm animals are warm blooded; roughly three-fourths of the food they consume is burned in their bodies to keep them warm, and one-fourth is available for activity and growth. Fish are cold blooded, and do not waste food in this way; their food does not require land or labor for cultivation. It follows that they ought to be cheaper to produce than land animals, as indeed some if not all of them are. During the war the occasion arose to compare basic cost of fish and pigs. Pigs were chosen for comparison because they are among farm animals the most efficient converters of vegetation into meat. The New England trawl fishery (mostly haddock and cod) and the California pilchard were chosen for comparison because we have accurate statistics of them. It was found that one man-year of effort produced 200,000 lbs. of fish in the trawl fishery and 500,000 pounds in the pilchard fishery, while a man-year on an Iowa farm produced 50,000 pounds of pig---a fourth as much as the trawler and a tenth as much as the pilchard fisherman. Arrived at in another way, in 1940 the over-all price of the entire fish production of the United States was 2.30 cents per pound; the unweighted average for the five leading farm meat animals was 6.42 cents. We need not refine these figures to show that fish cost less than meat. It would not be difficult to show that, at least in some fishes, such as the herring, pilchard, salmon, and mackerel, the food value, considered all around, is not only equal but superior to that of any farm animal.

From all this, it appears that fisheries can meet all-comers in the contest for first place in nutritive and aesthetic values at competitive costs of production in human effort, and has been doing so without benefit of subsidies, bounties, and other tender ministrations of the Federal Treasury.

How much fish is available to us? Suppose something should happen, or we could make something happen that would greatly increase the demand for fish; could we supply it? If the low costs just cited continue to hold, and a good solution of the marketing problem were found to make these costs effective in the competitive markets, it could really happen that we would



turn anxiously to the question of supply. If the United States per capita consumption of edible portions of fish were increased by one pound per year, the 350 million pounds of additional round fish required would itself exceed the production of any of our fishes except pilchards, salmon and menhaden. On the other hand, if we know that we are already at or near the limit of our production, then we will have to be content with the present relatively small magnitude of the fisheries industry as a whole and look to the improvements in the quality and attractiveness and better prices of the product for any increase of prosperity, and in some particular fisheries such as those of cod, shrimp and oyster for a moderate increase in volume.

This question certainly deserves more attention than it has had. Several years ago I had occasion to go into it by application of certain statistical methods, to find out, if possible, from what species of fishes important increases in supply could be taken. It appeared that, for the whole world, five zoological families of fishes supplied by far the greater part of all fin fish---namely, in descending order of magnitude:

1. The herring family, which includes the Atlantic herring, the pilchards, sardines, alewives, menhaden and shad;
2. The codfish family, the cod, haddock, pollock, hake, cusk, Alaska pollock or "skesko";
3. The salmon family, including the six great ocean species, plus the trouts and whalefish;
4. The flatfish family, the halibut, plaice, turbot, flounders and soles;
5. The mackerel family, the mackerels, tunas and swordfishes.

The great bulk of these occurs north of the 35th parallel of North latitude, and within relatively narrow areas of distribution. Biologists seem to agree that, though the herring is number one in fish volume, the supply of it has not been perceptibly affected by fishing. My estimate of the codfish was that it could supply an additional billion and a half pounds on the American side of the Atlantic north to the Arctic Ocean, and the haddock could perhaps be stabilized at 25% or so larger than present production. The salmon family is probably already at its peak potential. It seems unlikely that the major flatfishes, the halibut and plaice will ever break their all-time records, but some of the minor ones may, but even if they did, the added volume would not be large. The wide areas of the Pacific Ocean seem to offer opportunities for expansion of the tuna fishery, but the other mackerels are migratory and too erratic to be the basis of a steady trade. Among the invertebrates which furnish the bulk of trade, oysters, clams, scallops, shrimp, crabs and lobster, the possibilities of expanded oyster culture seem substantial, and the shrimp probably affords opportunity for still further expansion in addition to the spectacular growth it has already had, with larger boats, better gear and more aggressive exploration.

Conservationists are very aggressive in their insistence on the necessity of restriction to prevent decline in several, or perhaps all, of our fisheries. I do not recall hearing any conservationist promise that, even with the best program, we could ever get more of any kind of fish in the wild state than has been produced at some record time in the past. It is of course impracticable to discuss conservation except as to each particular species, but if the above general observation is true, then the maximum we can ever hope for from each species is in general the maximum record of species. We have recently made a calculation in a sample State, North Carolina, where the average of production of all fish for 1938-9-40 was 194 million pounds, valued at \$1,900,000. If we take the biggest single year's production on record for each species separately, and add these up, we got a total of 274 million pounds. If we imagine this quantity to be sold at 1940 prices for each species, the fishermen would have received \$5 million. Since it is exceedingly unlikely that every species of fish in the State would in the same year reach its record historical peak of volume, and could be sold at 1940 prices (or their inflated equivalent), it would seem that a 40% increase in production and a 250% total value is the utmost maximum that could ever be achieved, and that highly unlikely, from the wildlife fishery of that State. If a similar calculation were made for the entire country, something of the same kind could be expected, so that we would know roughly what the potentialities are for our present fished area. It does not seem likely that it would exceed 5 billion pounds. To this could then be added a sizable increase of cod, herring, etc., that could be realized on the more distant banks of Newfoundland to Greenland, and further northward and westward along the Aleutian Islands, Bering Sea and the Pacific Islands. Perhaps another equivalent or two of the redfish can be found. Such sources could conceivably bring the total to, say, 7.5 billion pounds.

Then there is the possibility of fertilization of water. This has already been done successfully in ponds and lakes of fresh water, and a very slight beginning has been made experimentally in salt water. The latter must be done in nearly enclosed bodies where there is tidal interchange or else the fish would escape. Our coasts, especially on the Atlantic and Gulf, afford numerous Scunds, bays and lagoons of salt or brackish water to which could be added the limiting factor fertilizers. Our installed production capacity for fixed nitrogen is nearly twice the peace-time requirement, and phosphate production is adequate. The economics of fertilization is not yet worked out, nor can it be until much experimental work has been done to determine the amount and value of the added fertilizers recovered in the form of salable goods. It would obviously be most economic if the produced fish were of the more valuable varieties.

Let us say that the net of all the above is a guessed at potential of 8 billion pounds worth, say, \$200 million (pre-war dollars) which would still be only 1% of the total value of agricultural foods (\$20 billion) or 2.2% of the 9 billion dollars of meat produced in the United States in 1942.

We now come to the potentialities of marketing. It must be admitted that here is and always has been the most stubborn difficulty of the fisheries industry. Let us first observe that international trade in sea foods has never been, and does not seem likely to be, large in tonnage. The



main market for our produce is here and it is likely to be subjected to considerable pressure by foreign countries seeking American dollar exchange. In fact this pressure is already beginning to appear.

Let us look at this domestic market. As said above, the total quantity of food of all kinds is absolutely fixed at about 1800 pounds per capita per year, and in this country we can and do produce more total food than we can consume. It follows that (except for increasing population) any increase in the sale and consumption of fish must result in a decrease of the equivalent weight of other foods, probably protein foods such as meat, eggs or poultry. In a market of absolutely fixed quantity, any competing product is certain to fall behind in sales if it fails to maintain its over-all competitive desirability.

The American civilian dietary in 1943-4 of about 1766 pounds consisted of 770 pounds of milk, 266 pounds of animal origin, meats, poultry fats and dairy products other than fluid milk, and 709 pounds of food of vegetable origin. The animal products include 143 pounds of meat, 43 of eggs, 26 of dressed chickens, 14 of lard.

The national average of fish production for 1938-3-40 is 4.252 billion pounds, worth \$96 million or 2.3 cents per pound. Of this quantity about 1.5 billion disappears in its entirety for fish meal, bait, or goes to shrinkage and spoilage, leaving about 2.75 billion pounds, round, or about 20 pounds per capita "apparent" consumption (i.e., whole fish). Some quantity between 1 and 1.4 billion round or about 11 pounds per capita or around 4.4 pounds edible portions per capita is fresh or frozen, and about 5.2 pounds canned, or between 9 and 10 pounds fresh and canned actually consumed. This is about the amount of margarine and cheese combined or turkeys and cheese. The amount of fresh or frozen edible portions consumed is less than that of cheese.

New York City alone consumes roughly 25% of all fresh or frozen fish or nearly 12 pounds edible portions. In the rest of the country the per capita consumption is not much over 3 pounds edible portions or about the same as margarine. Thus we see that the consumption of fresh fish on the whole or round basis is only 1/7 of the butchered meat, and the actual edible portions are only 1/17 of butchered meat. We have part company with canned fish which, when canned, becomes groceries and has no problem of distribution. The problem of distribution of fresh fish of the past, present and future presents itself. This problem is: How can such a small volume of highly perishable product, irregular and uncertain in supply, made up of nearly 200 different kinds, derived from 5000 miles of coast line, be efficiently distributed to the thousands of cities, towns and villages of this country? The mechanics of actual transportation of such small volume, together with the necessary overhead costs of selling, servicing and collecting receivables, adds so much to the cost that, although the first cost of production is a small fraction of that of meats, it has lost all this advantage by the time it arrives at the retail outlet. Or, seen in reverse, since in order to sell at all final prices must be competitive with other foods, the excessive costs of distribution must be reflected in the low prices at which the primary producers as well as the intermediaries must sell. When from the last price, all the costs of packaging, refrigeration, transportation, and overhead are deducted, the small amount left to be divided among all parties is small, and the

low-first-cost advantage which ought to be used to force the way into the limited food market against the competition of other foods is lost.

Statistics alone go a long way to prove this. From 1900 to 1940 the population increased 73%, while the fisheries of the Atlantic, Gulf and Great Lakes increased 16.1% in quantity, and 44% in dollars which declined 40% in purchasing power. Wholesale price index of all commodities (what fish people have to buy) increased 40% while over-all fish prices of the Atlantic, Gulf and Lakes increased 24%. The small increase in production just about made up for the failure of prices to balance inflation, so that the east coast over-all reward stood still. The fisheries of the country as a whole also just about doubled, by increasing from 1.9 billion to a little over 4.25 billion pounds by adding 2.35 billion pounds mostly on the Pacific Coast, and the dollars increased 111%, but the purchasing power of the dollars received was only 74% more, or a net of 82.5% increase in purchasing power. The over-all price of fish in the United States was the same in 1940 as it was in 1900 - 2.3 cents in both years. Of the 2.35 billion pounds increase, about a billion was in menhaden and pilchard not used for human food. The net of it all is an increase of food fish in 40 years of about 70% in volume of edible fish and 74% in real value, while the population increased 73%. The figures show that the opening and exploiting of the Pacific fisheries has so far just about enabled the fisheries industry to keep up with the population. But there are no more Pacific coasts, though there is a Grand Bank, Davis Straits and Bering Sea.

These over-all figures are of limited value except insofar as they raise the question of where the supply is to come from as population grows further and as a rough measure of how well the industry as a whole is living up to its opportunities. If time permitted us to go into detail, numerous cases would be found where items have fallen far short of opportunities while others have risen spectacularly.

This fact is vividly illustrated by the oyster. While the population was multiplying by 2-1/2 between 1880 and 1936, the production of oysters has diminished to about two-thirds of what it was 66 years ago, which means that the per capita consumption is now about 25% of what it was then. This trend is, in a measure, discernible in most of the fisheries, namely, that production and sales have not kept up with the increasing population. In part, this is naturally expected, where the great increase in population has occurred in the center of the continent beyond the reach of fast transportation of perishable sea foods. But it is not so easy to explain convincingly why the total production of the oyster has fallen off, without a corresponding rise in prices which would reflect increasing scarcity, while the shrimp has increased nine fold in volume and more than doubled in price.

The oyster, immediately preceding the war, stood third to the salmon and tuna in money value among all the fisheries of the country, though the pilchard and shrimp were not far behind it. Since it seems unlikely that the salmon can ever be increased much, and oyster culture and the opening of more oyster bottoms could put the oyster in premier position, even though it has fallen to two-thirds of what it was in 1880. In order to do so, it will be necessary to discover and correct whatever factors have seemingly limited its desirability in the market.

Since as shown above, the total amount of food consumed by a person is constant, any food commodity which fails to maintain its relative desirability

will fall behind. This seems to have happened, in some measure, to several of our fish and sea foods. Most food items have been revolutionized in the improved forms of packaging and presentation, and many have been greatly improved in quality, ease of handling and sanitary character. Fish did not begin to improve in these respects until about 1921 after most other foods had already made much progress. Since then, however, a number of things have happened to fish distribution all along the line, and within the past very few years some very important developments have occurred which may put fish in their proper place.

Among the developments of the past 30 years are:

The entry of the chain grocery stores into the merchandising of fish and sea foods, along with meats. This movement alone has made sea foods conveniently accessible to millions of people who otherwise would never see fish. They have also applied to the merchandising of sea foods the methods of efficiency, skill, economic intelligence, and mass purchasing for cash at low cost which had been much lacking before.

The introduction of filleting, or the preparation and packaging in convenient and attractive form of the edible parts only, while the 50% or 60% or more of the offal is kept behind for the manufacture of by-products. This movement deserves to become universal for fin fish, and until it does, those fish distributed whole will continue to be at a disadvantage. The one thing that has been hindering this development has been the lack of automatic machines for filleting, but these are now beginning to make their appearance. I think it is safe to predict that sometime in the future nearly all fin fish will be filleted. As a corollary to this, a small low cost unit for making fish meal is urgently needed.

The other essential to really successful distribution of extremely perishable sea foods is not only freezing technically, but, equally important, the public acceptance of frozen foods. This movement, as you all know, had its beginning in the fish industry but hung in the balance of doubt for many years because it became apparent that fish alone could not carry the whole overhead cost of refrigerated retail distribution, and had to await the perfection of the process for other perishables and the coming into widespread use of the wholesale and retail facilities, and all had to survive while the public gradually came around to accepting frozen foods. Happily, thanks to those companies which were able and willing to risk millions of dollars in the development, these hurdles have now all been crossed and the movement, with freezers, trucks, lockers, and retail refrigerated cabinets, is gathering momentum everywhere. All branches of the sea food industry will be well advised to keep abreast of this development, and not let its competitors steal the show, as the salt manufacturers a few years ago stole, appropriated and took over the iodine story that originated in the fisheries.

Ways must be found (the labor unions graciously permitting) for improving the handling of fish not only aboard fishing boats, but all along the line, where deterioration takes off the bloom of freshness, loads on an unnecessary competitive disadvantage, and eases the way for foreign competition from more northerly and colder waters nearer home bases.

Quite likely, the future will witness the application of new principles in catching fish---such as airplane spotting, detection by radar or its

equivalent in underwater short wave echo sounds, and it may use light, electric potentials or supersonics in the driving or luring fish into nets or traps, or to kill them outright and instantly as they should be killed, instead of causing them to die in a state of struggle and fatigue as they now do in almost all catching devices.

Add to all this the possibilities of fertilizing water and of transplanting by airplane the most desirable fishes from all parts of the world, and you can make a right pretty picture of the fisheries.

Hotel New Yorker, N. Y. C., June 5, 1946

ANNUAL REPORT OF THE OYSTER INSTITUTE, 1945-46

Lewis Radcliffe, Director

Two eventful years have passed since our last Annual Convention. Wars with two mighty nations and their satellites have been won. We met the problems arising out of war with reasonable success. These included shortages of tin and other scarce materials, losses of key men through the draft, acute shortages of common labor, rapidly rising wages and costs of operations, the threat that price ceilings might be established on fresh oysters at a time when the demand was great and the supply light. In addition, the U.S. Public Health Service required a revision of its control measures, and even before hostilities had ended, the Food and Drug Administration called for a hearing for the purpose of establishing definitions and standards of identity for fresh oysters, adding to your individual worries and problems, and, incidentally, to mine.

With the ending of hostilities, we had high hopes that the worst was over, and that once more we could resume operations on a normal peace-time basis with a minimum of regimentation. These hopes have not been realized. The container situation is steadily growing worse. Lessening supplies of tin, with production of steel reduced by strikes, and failure of the Civilian Production Administration to recognize the need for giving oysters---a meat protein food---better than a "C" priority status in M.81 as amended March 1, again reveal the need for representation in Washington to look after your interests. Another illustration is that of the attempts of labor's representatives in Congress to amend the fisheries exemption section of the Fair Labor Standards Act of 1938 by limiting the exemption only to actual fishing operations. The basic principles involved in this exemption should be maintained if possible.

At a hearing before the House Committee on Labor, on November 6, 1945, I filed a brief calling attention to the inequities which would result from imposing further restrictions on freedom of operation of those engaged in the fishing industry, pointing out that because of the complexities of the business, the perishability of the product, and other factors, it was impracticable to establish a dividing line between fishing and land operations which would be equitable.

At a hearing before the Rivers and Harbors Committee of the House, on November 14, 1945, then considering anti-pollution legislation, I pointed out the effects of pollution on the oyster industry, including evidence received from Rhode Island, Connecticut, New York, Virginia, and Georgia. Attention was called to the decline in production in Massachusetts, Rhode Island, Connecticut, and New York from 7-1/4 million bushels in 1910 to 1-1/2 million bushels in 1940. In 1911 in Rhode Island the state was receiving revenues from the lease of 20,846 acres, and in 1944 from only 1,936 acres, a reduction of over 90 per cent. In Virginia it was estimated that approximately 1,000 acres annually for the past three years had been turned back to the state by private planters by being rendered useless by pollution. The Committee has introduced a very good bill, H. R. 6024, which is expected to pass the House.

The first part of the paper discusses the importance of the study of human evolution in understanding the origins of modern humans. It reviews the evidence from fossil remains and genetic studies, highlighting the role of Africa as the birthplace of modern humans. The paper also discusses the role of migration and adaptation in the evolution of modern humans, and the importance of understanding the genetic diversity of modern human populations.

The second part of the paper discusses the role of culture in human evolution. It reviews the evidence from archaeology and anthropology, highlighting the importance of cultural evolution in understanding the development of modern human societies. The paper also discusses the role of language and social organization in human evolution, and the importance of understanding the cultural diversity of modern human societies.

The third part of the paper discusses the role of environment in human evolution. It reviews the evidence from paleoecology and paleoanthropology, highlighting the importance of environmental factors in understanding the evolution of modern human populations. The paper also discusses the role of climate change and human adaptation in the evolution of modern humans, and the importance of understanding the environmental diversity of modern human populations.

The fourth part of the paper discusses the role of genetics in human evolution. It reviews the evidence from molecular biology and population genetics, highlighting the importance of genetic studies in understanding the evolution of modern human populations. The paper also discusses the role of genetic drift and natural selection in human evolution, and the importance of understanding the genetic diversity of modern human populations.

While price ceilings on most important fishery products have resulted in considerable black market dealings, such as in scallops and shrimp, our industry has been most fortunate in that Messrs. Triggs and Lynch appear to have fully appreciated the difficulties that would have been encountered had attempts been made to establish price ceilings on fresh oysters. I congratulate our members for their efforts to hold prices in line, and thoroughly believe that this worked for the best interests of the consumer as well as our members. What has not been fully appreciated in the past is that oyster prices in many areas have been too low to afford the oysterman a reasonable return, and that prices never again should be permitted to sink to levels where the tonger can barely eke out an existence.

On June 13, 1945, the Acting Administrator for the Federal Security Agency (Food and Drug Administration) sent out notices of a hearing to be held on July 17 for the purpose of receiving evidence to serve as a basis of promulgating "Definitions and Standards of Identity, Quality and Fill of Container, Raw Oysters Identity". In reviewing this proposal, we immediately recognized the fact that information on which to base such proposals was inadequate, and that it was wholly impracticable to attempt to assemble same in the intervening period, that, in fact, months of study continued through at least one entire season and at many different production centers, under a wide variety of conditions, would be necessary for the proper preparation of our case. Obviously, the only course of action open to us was to attempt to secure postponement of hearings as long as possible while seeking to gather the facts necessary for reaching an understanding on definitions and standards which were reasonable and practical. The Food and Drug Administration was primarily concerned with two things: (1) limiting the time of exposure of fresh oyster meats to fresh water in their preparation for market to as short a time as practicable, and (2) attempting to reach an agreement on reasonable size grades for oysters. Had it been willing to limit its proposals to these two matters, our problem would have been greatly simplified with better cooperation from the industry. It is not necessary for me to review the hearings of July 17 and August 14, 1945, and January 15, 16, and 17, 1946, and the subsequent filing of written arguments for which the deadline was February 26.

I should like to add that the preparation and handling of all these details imposed an exceedingly heavy burden on your Washington office over a nine months period during one month of which I was without a regular secretary. Secondly, Congressman Bland deserves your sincere thanks for his calling a hearing before his Committee on July 16, for his appearance at the hearings, and for printing the testimony given at the hearings so that all might have it available for study. And, finally, those scientists who carried out investigations and gave their testimony at the hearings contributed more than you will ever realize to a clarification of the whole subject, and thus safeguarded your best interests. In fact, the oyster industry is indeed fortunate in having such a group of outstanding scientists who are trying to solve your problems.

If you have read the Institute bulletins, you are familiar with the efforts of your Washington office in preventing surplus vessels being anchored where they would endanger normal oyster operations, in closing the door on the possible introduction of Japanese seed oysters to Atlantic coast waters, and in keeping you abreast of the times through trade reports, citations of current literature and notices of bills affecting your interests

and their treatment by Committees of Congress. I shall not undertake to review these and the many other activities of your Washington office.

The war has been won, we are in the midst of reconversion, and there will be a shortage of food for at least another year. We should be raising our sights to look beyond that horizon and be preparing to meet the problems that will arise when supplies of meats are again plentiful. We have seen the shrimp cocktail and the fruit cup displace much of the demand for the oyster cocktail and oysters on the half shell. We have seen per capita consumption of oysters drop from 2-1/2 pints in 1912 to about 3/5 of a pint at the present time. We are witnessing a revolution in food merchandising---the rapidly growing packaging of foods, particularly quick-frozen, packaged foods which some feel will be the food giant of the future, rapid changes in the form of the package itself to meet new developments such as shipments by air, the growing interest of department stores in these packaged forms, and many other innovations which we need to follow closely and adapt to our needs. I would be remiss if I did not add a word of caution to our members: Some of those fostering these new developments are making claims of future growth that are hard to believe. It, therefore, behooves each member to thoroughly try out any planned changes before plunging. This is particularly important in such processes as quick-freezing. Make certain to master all the difficulties before expanding too rapidly.

To return to the subject of the reduced per capita consumption of oysters: one of the most fruitful fields of research is for us to canvass the homemakers of the nation to ascertain why they do not eat oysters oftener, and what things we can do to overcome their indifference or objections. This has been discussed with Barbara Daly Anderson of Parents' Magazine's Consumer Research Bureau, and she has agreed to undertake a survey of subscribers' views before our next Convention. As a preliminary study, this holds great promise of being helpful. In my judgment, it should be only the initial step to a much larger survey to disclose regional, as well as national, views to serve as the basis for a nation-wide program of advertising, education and publicity.

The difficult problems handled by this office since our last Convention have been made easier by the splendid support given by your officers. Mr. Darling, as the Association's President, has made special trips to hearings, meetings, and conferences to represent you, and I cannot express adequately in words the aid and sound advice he has given me in carrying forward our program. In meeting the difficult reconversion problems which lie ahead, I hope every member will communicate his views on important subjects, and his criticisms of our program, and especially that you keep your officers and Directors informed as they decide the policies which I am expected to carry out. You have had the benefit of thirteen years of fruitful cooperative effort to guide you. With your support, it should be possible to achieve even greater success.

As one reviews conditions today, he is reminded of Dickens' description in *A Tale of Two Cities*: "It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity, it was the season of Light, it was the season of Darkness, it was the spring of hope, it was the winter of despair." May we soon arrive at a period of tranquility in which normal life and business will be restored.

Hotel New Yorker, N. Y. C., June 5, 1946

THE PRACTICABILITY OF SHIPPING OYSTERS AND OTHER FISHERY PRODUCTS BY AIR

Spencer A. Larsen

Rapid progress is being made in adapting the airplane to the carriage of cargo. All-cargo planes and combination passenger and cargo aircraft are now spanning the continent daily carrying products of the farm, factory, and sea at transportation charges that as late as three years ago were believed quite visionary.

During the past three years at Wayne University, we have been analyzing the prospects and problems of shipping various categories of commodities by air. Our principal contributions to date have been in the field of perishables -- fresh fruits, fresh vegetables, drugs, cut flowers, and fishery products. We have concentrated on these commodities because (1) no one else seemed to be paying very much attention to them, (2) perishables constitute an important portion of the overall air cargo potential -- possibly as much as 60 to 70 per cent of the total -- the exact percentage being largely dependent upon the level of transportation charges to be paid for air freight.

At present, air freight rates range between 12 and 25 cents per ton-mile, which is equivalent to 12 and 25 cents for the transportation of one pound of merchandise a distance of 2,000 miles.

Just what rates can be offered and the volume of traffic each rate level will generate is one of the many puzzling problems now facing air carriers who are now going through a most trying and critical period. Chills and fever, alternately, settle in upon this infant industry, but the child has a powerful will to live and the urge to grow. Each month sees tangible progress toward such goals as we projected in our first study, Air Cargo Potential in Fresh Fruits and Vegetables, Air Transport Studies Numbers 1 and 2, Wayne University Press, Detroit, 1944, which was completed two and one-half years ago. In that study it was pointed out that in the list of commodities likely to become available for air carriage, perishables show promise of furnishing important quantities of traffic to the skyways. At a rate of fifteen cents per ton-mile, it was estimated that only token quantities of fresh produce traffic may be expected to materialize, but that as rate reductions were made the volume for air transport would increase by leaps and bounds.

Over a year ago, and with the invaluable aid of our sponsors -- United Air Lines, the Goodyear Tire and Rubber Company, A & P Food Stores, Pan American World Airways, Hinde & Dauch Paper Company, and Shellmar Products Company, and with the cooperation of the Division of Commercial Fisheries, U. S. Fish and Wild Life Service, we began a study of air cargo for fishery products. I am now prepared to say that fishery products show promise of furnishing significant quantities of traffic to the air lines. At the very top of the list of fishery products that are candidates for air shipment stands shell-fish -- oyster, shrimp, clam, lobster, and crab.

Employing appropriate air cargo propensity criteria and obtaining the judgments of a large number of seafood experts, it became evident that

shellfish are inclined more strongly to air shipment than most other categories of fishery products. This stronger inclination is traceable to (1) relatively high value per pound of edible shellfish meat, (2) higher rate of perishability, (3) strong consumer demand for top quality shellfish, (4) relatively long season of production, and (5) the opportunity to save a great deal of shipping weight by eliminating the shells, tin containers, heavy barrels and ice. In the case of the oyster and other fishery products, most of the dead weight which now accompanies these products to market can be eliminated when shipping by air.

Oysters in particular are well suited to air shipment. They are found in all major fish producing areas of the United States from Massachusetts to Florida and the Gulf region, as well as the Pacific coast. According to the U. S. Fish and Wild Life Service, the average annual production of oyster meat in the United States is approximately 90 million pounds and Dr. Lewis Radcliffe, Director, Oyster Institute of North America, states that oysters are the most important of all underwater crops in this country. Furthermore, Dr. Radcliffe points out, this production can be increased tremendously through an extension of our oyster farming operations. "It has been estimated that there are approximately 13,000,000 acres of land along our tidal waters which potentially might serve for oyster farming; yet, at the present time only about 1,000,000 acres are actually productive, and much of this only nominally so." In view of this impressive production potential, Dr. Radcliffe adds: "There need be little fear for a scarcity of oysters so long as the oyster farmer is properly compensated for his labor." Radcliffe, Lewis; Hygeia, The Health Magazine, November, 1938.

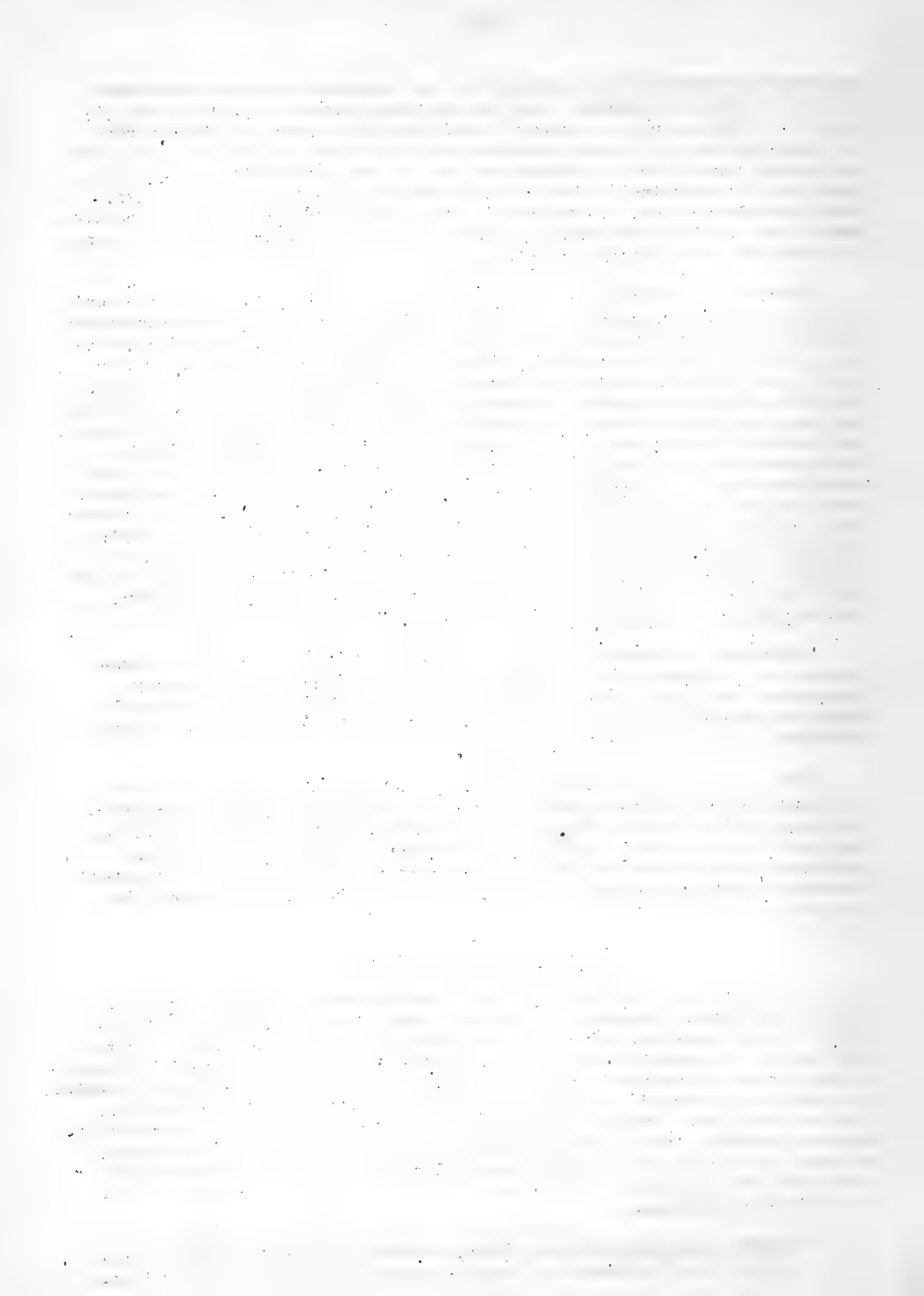
Marketwise, it might be said, that despite this large production potential the producer need have little fear of obtaining a satisfactory return from the sale of his product if only the high sea flavor and full quota of nutrients in his oysters can be delivered intact in sanitary and attractive packages to in-land markets.

Like all fishery products, oysters stand high in consumer favor when the succulence and original full sea flavor are delivered to the ultimate consumer. Failure to deliver seafoods of consistently high quality to in-land markets has greatly lessened the effective market demand for these products. I hasten to add, however, that the record of the oyster industry in this respect is probably much better than for the fishery industry in general.

The Inland Oyster Market

During the past few months we have been conducting consumer acceptance surveys for fishery products in Chicago, Kansas City and Detroit. The results of these surveys, as well as the national air cargo potential and the problems of transporting seafood by air, will be treated in a special volume which we plan to publish in the near future. In connection with these studies and with the cooperation of all the airlines serving Detroit and the U. S. Fish and Wild Life Service, we have made sixty experimental air shipments of fishery products. Six of these shipments have been oysters. As a result, we feel we are now able to throw the spotlight on some of the factors pertaining to the prospects and problems of marketing certain species of air-borne fishery products.

A logical place to begin our study, we felt, was in the consumer markets. A representative survey of Chicago consumers revealed that oysters,



in this number one inland market area, rank high in consumer familiarity. Eighty-five per cent of the consumers in Chicago indicated an "eating knowledge" of oysters. In a list of 36 species of fresh fish the oyster rated fifth in familiarity. Only the lake fish -- trout, perch, whitefish, and one other shellfish, shrimp -- received a higher familiarity rating. In answer to the question, "Which of the fresh fish do you enjoy eating most?", oysters received a preference rating among the shellfish second only to shrimp. This preference for oysters runs high in all income groups.

The estimated annual per capita consumption of shellfish in Chicago homes, and excepting approximately 20 per cent of the lowest income homes, was 3.6 pounds. Oysters accounted for 30 per cent of this total. 13% of all fresh fish sales in Chicago are oysters. Assuming no increase in price, Chicagoans estimated that they would increase their home consumption of shellfish by 20 per cent, if air-borne quality were available to them. They would increase their restaurant orders for fish and shellfish by 25 per cent provided they could be assured of the quality contemplated for air-borne shipments. Obviously, consumers do not know exactly how much they would increase their consumption of seafoods if the market quality were improved, because a great many inlanders have not had an opportunity to make direct comparison of the conventional market quality with the strictly fresh product.

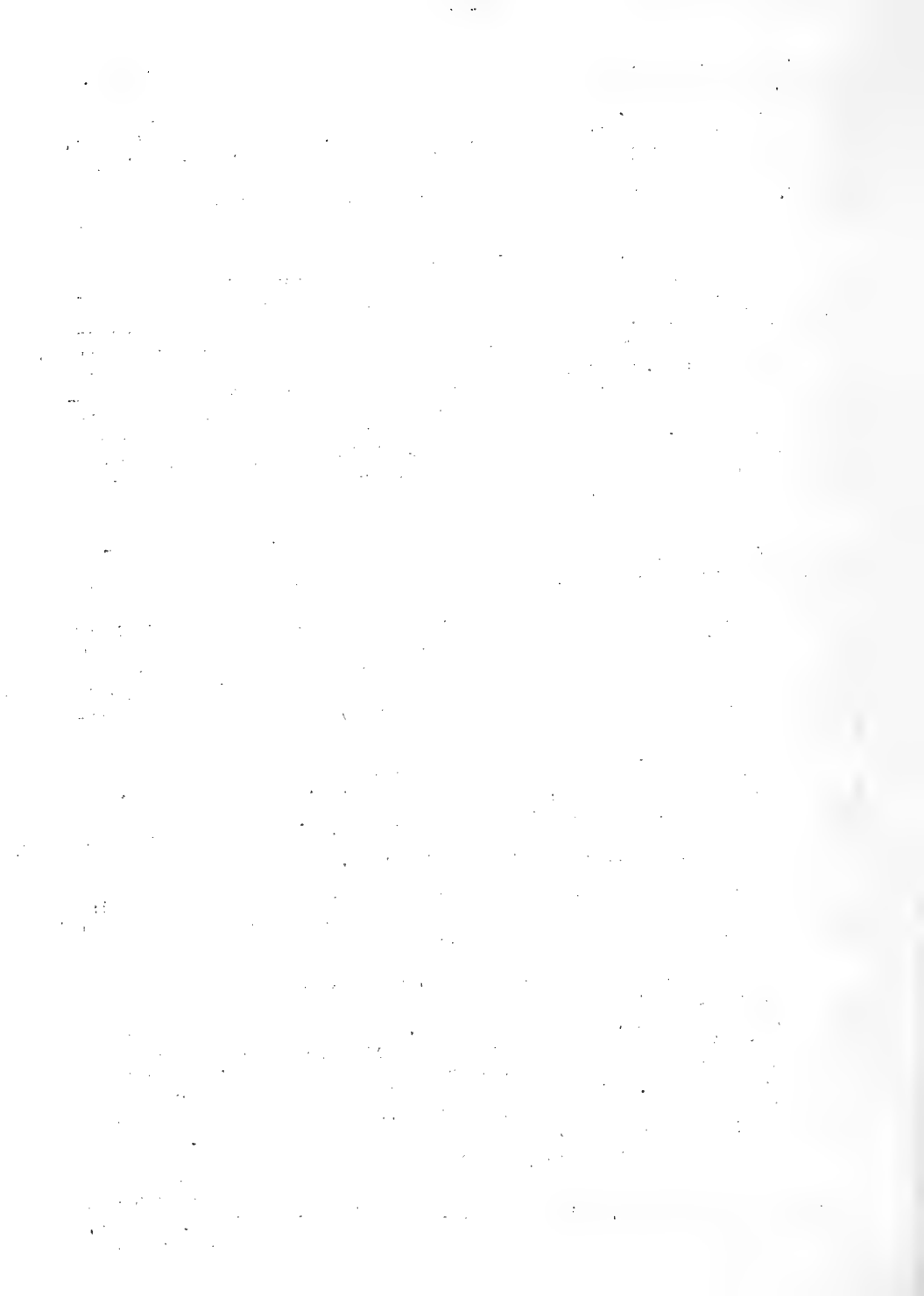
In addition to their many advantages from a nutritional standpoint, oysters fit in with modern living in that they are easy to prepare and serve and they are free from bones, two reasons frequently given by consumers for eating certain kinds of fish less often than they otherwise would. Another important market deterrent is the quality of seafood now available in inland markets. Thirty per cent of those interviewed in Chicago homes considered the quality of fresh fish now available on the markets as poor, and two of the major reasons given for not ordering fish and shellfish more frequently in public eating places were: (1) uncertain quality, (2) dislike of restaurant preparation.

In Kansas City only 64 per cent of the persons interviewed had an "eating knowledge" of oysters. This was the sixth highest rating of all fish and shellfish -- perch, whitefish, pike, catfish, and shrimp being better known. As to eating preference in Kansas City, oysters rated second in the shellfish group -- topped only by lobsters.

The annual per capita home consumption of shellfish in Kansas City is estimated at only .59 pounds. This is approximately 10 per cent of the total fish and shellfish consumed in Kansas City homes.

An increase of 66 per cent in fresh fish consumption was estimated by Kansas City consumers if they could obtain seafood of airborne quality and at no increase in price. On the other hand, 98 per cent of the persons interviewed said they would be willing to pay five cents more per pound for seafood of the quality which they believed could be made available to them through air shipments, and 80 per cent said they would pay ten cents more per pound. The reasons given for infrequent use of fresh fish in Kansas City were (1) prices too high, (2) desired varieties unavailable, (3) unsanitary marketing and poor quality of fresh fish.

In Kansas City restaurants, oysters rated second in the shellfish group in number of times eaten. Eighteen per cent of those interviewed, however, said they never ordered fish or shellfish in restaurants. Their primary



reason for not ordering was uncertain quality. Both in Kansas City and in Chicago, restaurant eaters rated the quality of oysters generally as good. Nevertheless, in Kansas City consumers indicated that if strictly fresh fish were always available they would increase their restaurant orders for fish and shellfish by 41 per cent. They also indicated a willingness to pay an average price increase of 12-1/2 cents more per meal, where oysters were served as the entree, provided they could be sure of the quality.

Distribution of air-borne oysters to the better class of restaurants in Detroit indicated that customers are suspicious of the freshness of oysters if served any way other than on the half-shell. Although they assume the oyster to be fresh if served in this manner, we have demonstrated to our satisfaction that consumers can have fresher oysters at inland points if the edible portion is removed from the shell, packaged in a moisture-proof film, kept under adequate refrigeration, and brought to the ultimate consumer within one to three days after shucking. With air transportation becoming available, the oyster industry might well investigate the possibilities of removing live oysters from their shells and placing them in soft, moisture-proof pliofilm packages. I am told by those who have made a study of oysters that if appropriate temperatures are provided and if the oyster is kept away from fresh water that it will live for a period of seven days, provided it is washed in sterile sea water and packaged in such a manner as to confine a certain amount of its own CO₂ in the package. Dr. H. R. Prytherch, Director, Fisheries Laboratory, Beaufort, North Carolina, and we are continuing explorations into these possibilities.

Assuming that it is possible to deliver shucked, live oysters to inland markets in pliofilm packages and via air transportation, there still remains the problem of re-educating the public to the fact that the air-borne, shucked oyster is strictly fresh. Taking advantage of the opportunity to brand the product, however, and again assuming it possible to deliver live oysters to market, some far-seeing, alert oyster producer is going to explore its market opportunity. Again it would not seem to be beyond the realm of possibility that oysters could be shucked and sealed in a pliofilm envelope with a small quantity of sterile brine solution to prolong the life of the oyster. Dill pickles are now marketed in this manner.

If the apparent increased consumption potentialities are as impressive as they appear to be, then certainly oyster producers and dealers will eventually discover new market opportunities and will proceed to take full advantage of them. Taking it for granted that a substantial market opportunity exists for fresher oysters and other fishery products, what changes must take place in order to develop this air-borne potential? Foremost, in the thinking of those who are exploring the problem is a combination of new facilities such as plastic, transparent films, light-weight containers, temperature control, and the speed of the airplane -- all now available to serve the fishery industry now plagued with the ill effects of the passage of time upon their products. It was with the hope of making some contribution to this aspect of the problem that we, and those who are cooperating with us, set out to explore better ways of preparing and packing seafood for air shipment.

A reconnaissance survey indicated clearly the need for a clean break with traditional methods of packing fishery products if air transportation is to be used. Conventional methods of packing fishery products for air transport were found wanting because (1) there is too much useless weight, (2) water from melting ice is a constant threat of damage to other cargo,

(3) melting ice would spread objectionable fish odors throughout the cabin of the plane -- especially objectionable where passengers are to be carried in the same plane. Moreover, planes are expensive, and the melting ice would deteriorate their vital structures, (4) the conventional ice pack results in a leeching out of the flavor and important nutrients of the seafood.

An examination of the containers revealed that seafood is now transported in wooden containers of varied dimensions and weights. These containers range in size from 50 to 200 pounds in capacity. A wooden container designed to ship 50 pounds of fish weighs about 20 pounds itself and calls for 30 to 35 pounds of ice --- being re-iced as often as is necessary. The shipping of 50 pounds of fish in the conventional manner, therefore, requires about 50 pounds of container and ice. This ratio lessens as the size of the container increases, but in no case does the container and ice weigh less than 70 per cent of the net weight of the fish. These wooden containers cost an average of about 1-1/4 cents for each pound of seafood capacity. Obviously, the conventional fish pack, including the standard barrel with its ice and tin cans, is unsuited for air shipments of oysters.

In an effort to develop new packaging facilities for air shipment of fresh seafoods, Air Cargo Research at Wayne University provided a set of specifications and enlisted the aid of Goodyear Tire and Rubber Company, the Hinde & Dauch Paper Company, and the Shellmar Products Company in producing suitable films and containers that would make possible an iceless fresh fish pack. The specifications set forth for an iceless container were (1) it must be an inexpensive, single-use container, (2) it must be light in weight -- not to exceed ten to twelve pounds of the gross weight when packed for shipment, (3) it must be of such a size and capacity that when loaded it could be handled by one man (capacities of 45 to 60 pounds were suggested), (4) it must be insulated so as to eliminate the use of water ice when necessary to ship without the aid of mechanical refrigeration, (5) it must be so well insulated that seafood placed in the containers at a temperature of 33° F. will still be under 45° F. twelve to fifteen hours later when the outside temperature is 70° to 75° F. Higher temperatures are seldom met with where the airplane is actually in flight, (6) it should be constructed in independent units so that it might be adapted readily to shipment in either refrigerated or non-refrigerated vehicles.

The film to protect the natural moisture supply of the fish and to prevent the containers from becoming soaked with moisture and drippings from the seafood was required to be (1) moisture-proof, (2) light in weight, (3) soft in texture, and capable of a quick, moisture-proof seal, (4) of sufficient strength so as not to burst from the weight of the seafood or from the expansion that may take place at customary flying altitudes, (5) inexpensive. In our experimental shipments, we have been using various guages of pliofilm, and we find that a 170 guage pliofilm is suitable for the liners of the packages and cartons.

The results of a typical experimental air shipment, using these facilities, will be described.

On February 12 of this year, representatives of the Goodyear Tire and Rubber Company, the U. S. Fish and Wild Life Service, and myself, went to J. S. Darling and Son's modern oyster shucking plant at Hampton, Virginia. Oysters for the shipment were dredged on February 12 and shucked on February 13. On that same day they were packaged in one-pint pliofilm-lined

1. The first group of objections is that the Commission has not provided a sufficient number of copies of the report to the members of the Commission. The Commission has provided 100 copies of the report to the members of the Commission. The Commission has provided 100 copies of the report to the members of the Commission.

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The following information was obtained from the files of the Department of the Interior, Bureau of Land Management, and the Bureau of Reclamation, and is being furnished to you for your information.

The results of the experiment are shown in Table 1.

On 11/11/54, the following information was received from the Bureau of the Census, Washington, D.C.:

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packages which were heat-sealed and then placed in cold storage overnight. The temperature at the time of placing the oysters in the consumer unit packages was 57° F. The next morning, February 14, the oysters were packaged for shipment in three "Insulpak" containers -- one container accommodating 72 pints and each of the other two, 36 pints, making a total of 144 pints of select top quality oysters in the shipment. The temperature at the time of packing the consumer units in the master cartons was 41° F. -- nine degrees higher than is recommended at the time of shipment when this method is used. Lack of experience in methods of pre-cooling was the cause of our not bringing the temperature lower in this particular shipment. Immediately after packing, the oysters were taken to Norfolk, a distance of about 60 miles, and placed aboard the plane which took off from Norfolk at 8:00 A.M., made intermediate stops at Washington and Pittsburgh, and landed in Detroit at 12:30 P.M.

The shipment was removed from the plane and taken to Wayne University where temperature and condition were carefully checked and where the oysters were assigned to various test purposes. Temperature of the oysters when taken at 4:00 P.M., eleven hours after leaving Hampton, Virginia, was 47° F. or 6° higher than when packed. This represented a rise of slightly more than .5 of a degree per hour. This smaller than usual rise in temperature for this type of shipment resulted because the temperature in the cargo compartment of the plane ranged between 55° F. and 65° F. We have discovered since that when oysters are packaged in this manner and are transported at relatively high temperatures that the temperature of the product increases more rapidly or approximately at the rate of one degree per hour. It should be borne in mind, however, that oysters are marketed during the cooler seasons. In shipments where a solid pack can be achieved, as is the case with fillets and fin fish, generally the increase in temperature of the fish averages only .5 to .6 of a degree per hour. Less solid packs, as is the case with oysters, shrimp, etc., rise more rapidly in temperature or at about the rate of one-half to one degree per hour depending on the outside temperatures.

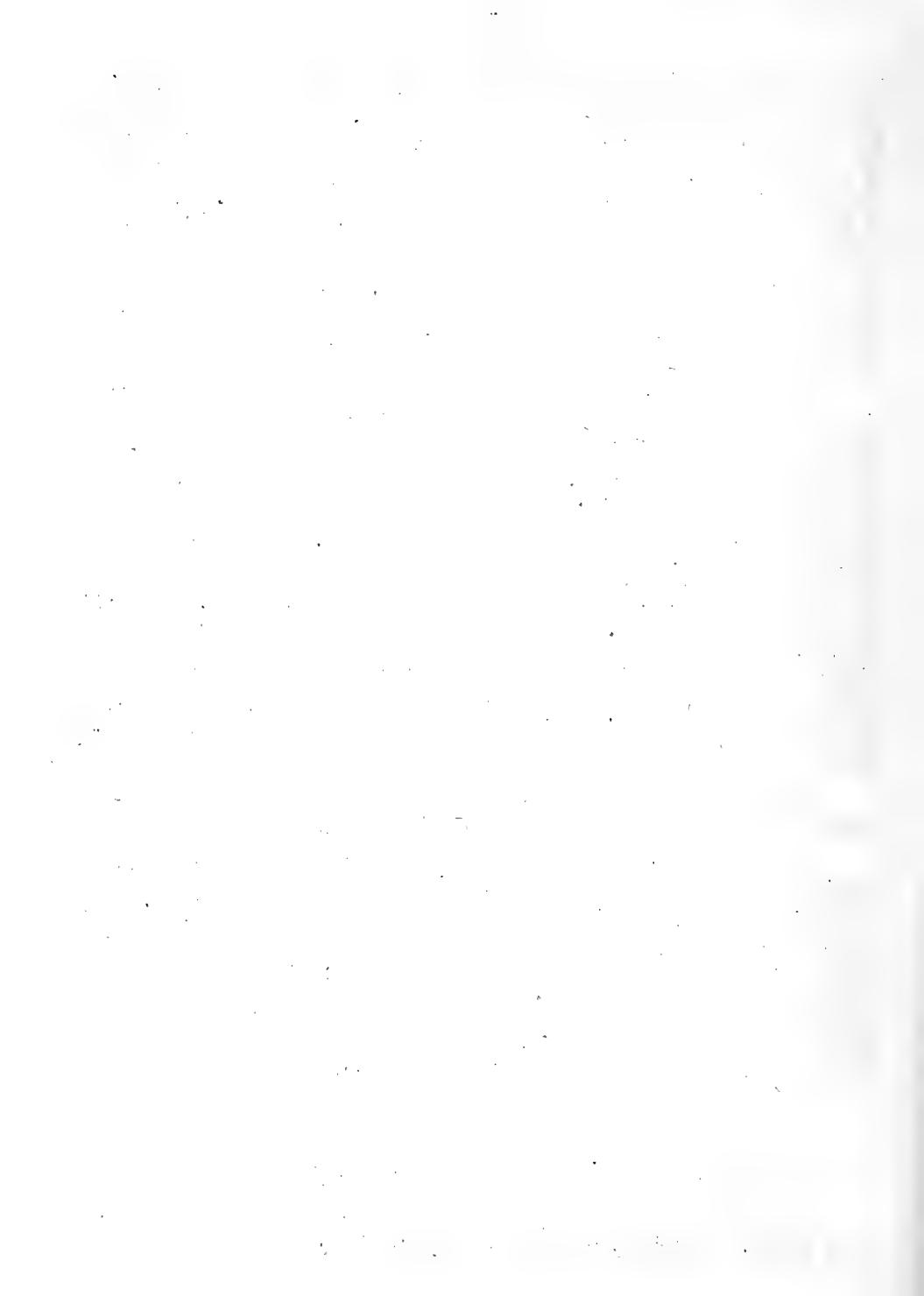
Examination of the consumer unit packages and the master container upon arrival revealed that all of them were in excellent condition.

Soon after arrival the oysters were examined for quality and general condition by Frank Clatworthy, Manager, Fish Department, A & P Food Company, Detroit. Mr. Clatworthy observed, "These are very, very fine oysters. They have the full natural sea flavor. Oysters by law may not have more than 10 per cent free liquor, but these do not have more than 2 per cent. There has been no breakdown whatsoever. The oysters were well-packed and free from shells. The package too looks practical and is as important an innovation as shipment by air. This type of package should fit splendidly into a multiple store operation. Also, it is a safeguard to the public, for it protects the contents from contamination and the watering of the product. The package is splendid and in my opinion has a future now."

Tests and their Results

Additional laboratory, commercial and consumer tests were made, as well as a storage test which extended over a period of several days.

Ten pints of oysters were used for an evaluation with a taste panel composed of home economists, dieticians, and housewives.



The panel members were instructed to prepare the oysters in the manner in which they usually prepare or serve shucked oysters purchased on the local market. After eating the oysters, the panel members judged them on the basis of: flavor, appearance, texture, and freshness. The ratings were placed on a five point scale with a numerical value assigned to each level of quality as follows: "1" - poor; "2" - fair; "3" - average; "4" - good; "5" - excellent. After rating the air-shipped oysters, the panel members were asked to give a comparative rating with shucked oysters purchased in Detroit markets. The average of all ratings for the air-shipped oysters on all factors reached a 20 per cent higher level of quality than the rating for shucked oysters obtainable in the local market. This, we believe, is evidence of the improved quality of oysters when they are properly washed, packaged and reach the consumer two days from the time of shucking as compared with oysters which reach the consumer five to ten days from time of shucking.

The consumer panel members were also asked the question, "Do you like this new type plioilm-lined package for oysters?" The answers were: YES -- 10, NO -- 0. This response indicated complete acceptance of this individual sanitary pack. Panel members commented:

"The flavor and texture of these oysters are marvelous."

"The oyster stew we made tasted like that at oyster houses around Boston."

"The liquor tastes like oyster juice rather than diluted crushed ice."

"This food should always be air-shipped, if this is the quality difference."

Another portion of the oysters were served, both raw and fried, to a men's club in Detroit. Thirty-six men were asked to give their evaluations and comments on the quality of the oysters and on the method of packing and shipping them. The following questions were asked: (1) As compared to the quality of oysters you usually buy on the local market, do you think the quality of these oysters is better, just as good, not as good? The answers were as follows: Better -- 28; Just as good -- 8; Not as good -- 0. Comments received were:

"Freshest oysters I ever ate."

"The disadvantages of living in the Middle West are now obliterated."

"Couldn't be better."

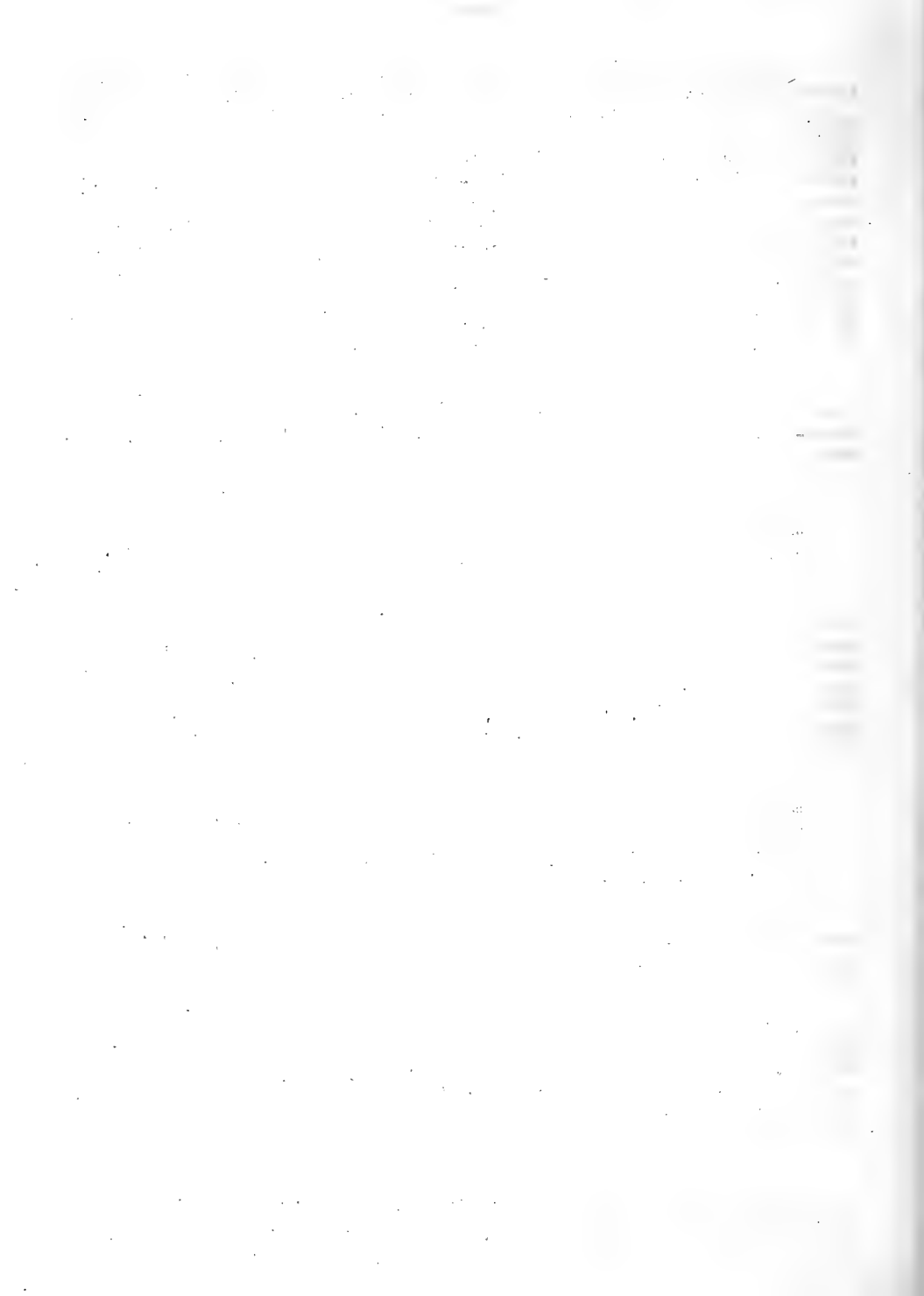
"Let's have more of them -- the quality is excellent."

"There is a psychological advantage in knowing they are fresh."

This group also genuinely approved of the new method of packaging, indicating that they felt there would be a definite advantage in sanitary control as well as a safeguard for freshness.

Twenty-two pints of the packaged oysters were placed on sale in an A & P Super Market in Detroit. The oysters were displayed in the regular fish counter with a small sign indicating that the oysters had been air-shipped. The oysters were offered for 69 cents per pint -- two cents above the current price of oysters in Detroit's A & P Super Markets at that time. Sale was begun at noon February 15 and the oysters were completely sold by 4:00 P.M. approximately five times the normal rate of sale for this particular store at this season of the year.

When customers purchased the air-shipped oysters, a card was given to each of them so that we might obtain a customer evaluation. Only nine cards out of 16 cards were returned, but eight of the customers replied that the



oysters were definitely better than the oysters they were usually able to buy. One replied that they were just as good. In answer to the question, "Do you like this new package for oysters?" all of the customers answered "YES", indicating 100 per cent acceptance of this new package by the customers who replied. Typical comments from these customers were:

"What we need now is more good oysters like the ones we got today."

"Flavor remarkable."

"The package is an advanced step and the oysters wonderful."

"They come near to the quality of freshly opened oysters on the half-shell."

--much better than any we have bought in the Middle West."

"They taste fresher and seem to have more flavor."

"Best oysters I have ever bought in a grocery store."

Ten pints of oysters were placed in storage of 39° F. and a package opened each day for a pH test and general appraisal. The pH tests were taken by the use of color metric reading, using Chlorphenol Red. The pH reading stood at 6.2 for six days after arrival, and on the four succeeding days stood at 6.1. In other words, there was no significant change in pH value for seven days from shucking time and only a slight change from then until the eleventh day.

The oysters were checked daily as to general condition and were kitchen-tested. It was noted after five days in storage that there was a decrease in the fresh, salty odor which was so apparent upon arrival. At the end of the eleventh day the oysters were still firm and of fairly good flavor, but they had lost the excellence of quality of the first few days after shucking.

On February 15 a representative number of the consumer unit packages were subjected to a complete altitude test by K. M. Cummings, United Air Lines, Chicago. It was felt that since the pliofilm packages were sealed so as to be virtually air-tight that they might expand and even burst when transported at high altitudes. The packages were placed in the altitude chamber and conditions representing an ascent made at the rate of 5,000 ft. per minute up to 8,000 ft. were executed. The rate of climb was then decreased to 1,000 ft. per minute until 10,000 ft. was reached where the first observation was made. This observation showed some expansion of the pliofilm bags. Continuing at 1,000 ft. per minute, an observation was made at 14,000 ft. at which altitude the pressure was quite noticeable. At 16,000 ft. the ascent was halted and the pressure decreased at a rate of 5,000 ft. per minute back to ground conditions. Observation of the packages after removal from the altitude chamber indicated no leakage or apparent deterioration of the packages. A second ascent was made at the rate of 6,000 ft. per minute throughout. At 12,000 ft. all wrinkles were puffed out of the pliofilm, indicating pressure. At 22,000 ft. the pliofilm bag was distended and at 29,500 ft. the pliofilm enclosed within the carton appeared to break, one large bubble forming outside the package. The ascent was continued to 30,000 ft. and then reduced to ground conditions at a rate of 5,000 ft. per minute. Examination after opening the chamber showed a rupture of the pliofilm bags where they had been left inside the carton, but bags which had been removed from the carton showed no deterioration due to decrease in outside pressure during these test runs.

The Manager of Perishable Cargo for United Air Lines concluded "the package appears to be entirely adequate for any altitude that we will fly for

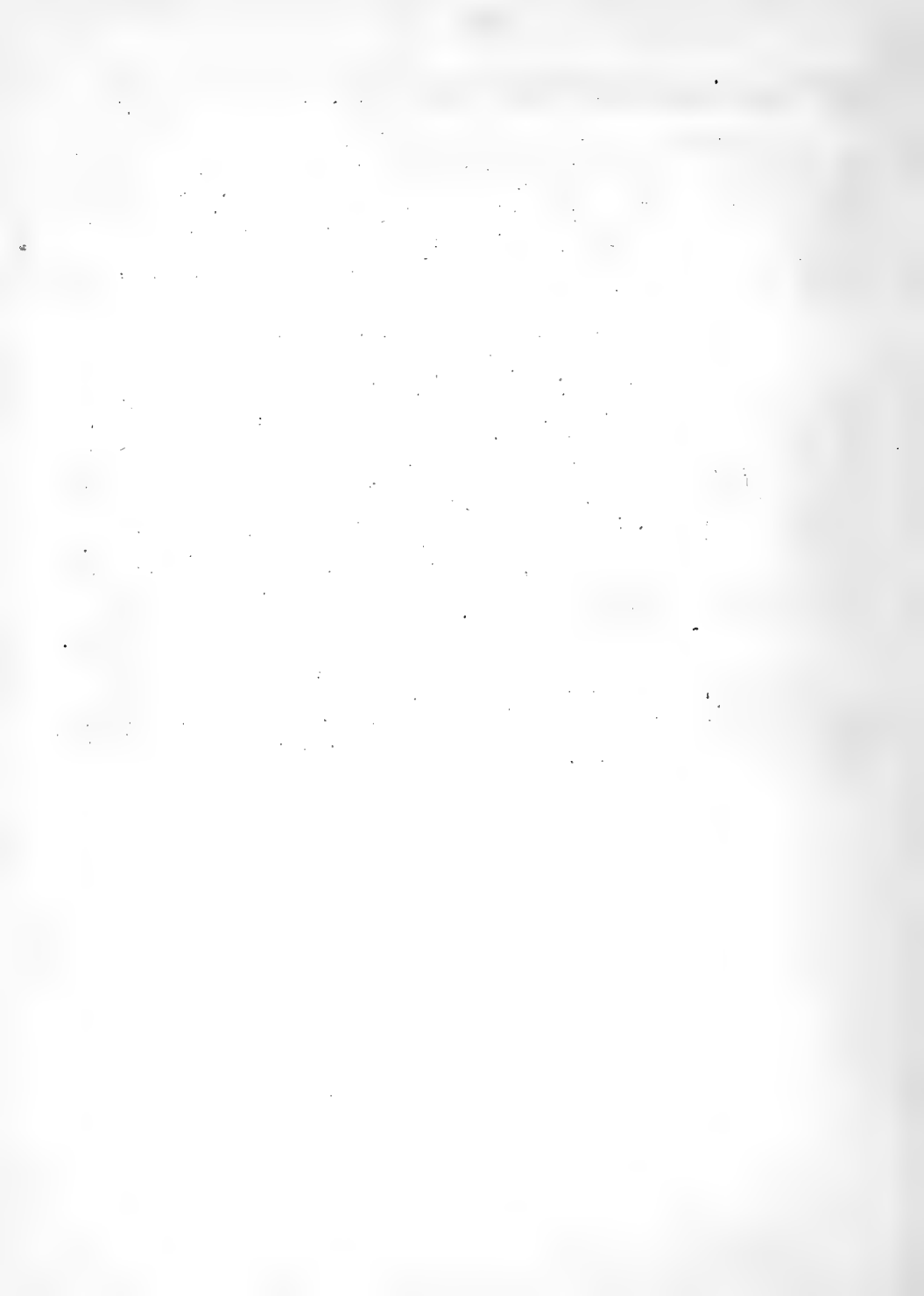
years to come, even if placed in an un-pressurized compartment of the new ships which are likely to come into service during the next few years."

This experimental shipment of oysters was carried on a regular passenger flight, hence those of us who accompanied it had an opportunity to observe constantly the effects of altitude upon the packages. Due to weather conditions, the flight was operated at an altitude much higher than usual, at times the plane flying above 12,000 ft. At this altitude there was no noticeable danger of damage from the difference in air pressures inside and outside the packages, although to be sure there was a very slight puffiness of the package.

Barriers to Air Transport of Fishing Products

Perhaps the weakest link in the chain of steps involved in the marketing of fresh seafood is that of temperature controlled storage at airports. As yet there is practically no provision for keeping perishables in the most appropriate temperatures during the time they are awaiting loading onto the plane, or during the time they must wait to be picked up by the receiver. Neither are adequate temperature controls to be found on any of the cargo planes that are now in service, and even if appropriate storage in transit were provided, it still would be impractical to store perishable cargo in the planes awaiting delivery to the receiver. Storage in an airplane is limited to the time in flight, since airplanes make money in flight and are not, like rail cars, intended for storage service. Airports that are being built in large cities, therefore, should provide temporary cold storage for perishables - which means storage with temperature and humidity controls.

Although the costs of freighting by air are rapidly approaching those of rail express, they nevertheless constitute an immediate barrier to the mass volume shipments. Other barriers are tradition and the shortage of raw materials with which to fabricate the new facilities that are needed for air shipment of fishing products.



Hotel New Yorker, N. Y. C., June 5, 1946

NEWER DEVELOPMENTS IN SHIPPING CONTAINERS

USED IN AIR SHIPMENTS OF OYSTERS AND OTHER FISHERY PRODUCTS

W. B. Lanham

The material which I am going to present this afternoon is not a completed study on the air transport of fresh oysters or seafoods but is more in the nature of a progress report of work done in cooperation with Dr. Larsen of Wayne University, several oyster producers in the Norfolk - Hampton area, two companies manufacturing shipping containers and with the Pennsylvania Central Airlines.

Dr. Larsen has already discussed the practicability of shipping seafoods by air. The Fish and Wildlife Service has been largely interested in trying different methods of preparing seafoods - oysters in particular - for shipment, helping to devise suitable shipping containers and determining the properties and limitations of the containers.

In the conventional methods of shipping fresh oysters by rail or truck, considerable amounts of ice must be used to keep the temperature of the seafoods low, which means added weight and volume. Both of these things are at a premium in aircraft and since the purchaser is paying for the gross weight of the package, it represents added cost to him. Because water ice is used, the drip presents a problem for aircraft, also. With these limitations in mind, it was felt that an insulated container could be developed in which chilled seafood could be packed and would allow only a small temperature rise during the short trips necessary in airplanes. The ideal container would have the following properties:

1. Good insulating value
2. Light in weight
3. Small in volume
4. Inexpensive
5. Easy to pack
6. Sturdy enough in construction to withstand normal handling in transit
7. Be non-returnable, that is, it would be used and then discarded.

In devising this container for use in air transport, there are three factors which will effect your oyster temperatures and will result in accelerated loss of quality. They are (1) the original temperature of the oysters at time of packing, (2) the outside temperatures during the trip and (3) the insulating value of the container.

Let us consider each of these, one at a time, and see their effect as applied to air transport of seafoods. Obviously, the lower the temperature of the oysters at the time of packing, the lower will be the final temperature, the better condition the oysters will be on arrival, and the longer their saleable life will be. If the oysters could be conveniently brought to just above freezing - say 32° F. - this would be ideal. However, few, if

any, oyster producers are equipped with or have access to cold rooms held at 32° F. For test purposes, shucked oysters were precooled to just above freezing in order to study the effect of this variable and was done by packing the cans in ice in a box or barrel and leaving them overnight in cold rooms held between 0° F. and 10° F. In the morning, the oysters were just above freezing. In other tests, the cans of oysters were packed in ice and kept in an ordinary holding room overnight. By this method, the oysters could be chilled as low as 34° F., two degrees above freezing.

Two air shipments were made using these two degrees of chilling - one to Chicago, Illinois and one to Seattle, Washington. Each shipment contained a package precooled to just above freezing and one precooled by packing in ice only. On arrival in Chicago, the oysters precooled to 32° F. were 3° F. lower than those precooled to 35° F.

However, in the shipment to Seattle, the difference was more marked. Here the difference in precooling was 2-1/2° F. but the final difference on arrival in Seattle 26-1/2 hours later was 8° F. In practical terms, this means that for each degree you lower the initial temperature of the oysters, you increase the length of the trip at least an hour.

In all but one of the flight tests, a recording thermometer was carried in the cargo bin with the oysters in order to get some idea of what temperatures to expect. Contrary to the ideas of some, the air temperatures and cargo compartment temperatures do not become very low during normal flights at altitudes up to 9,000 feet. During February, March and April of this year when our test flights were made, the average temperatures were 50-55° F. in the cargo bins with a low of 32° F. when the plane passed through a cold front and a high of 70° F. when it passed through a warm front. To get a better idea of how the temperatures varied, this recording thermometer was left in one of the belly compartments of a P.C.A., DC-4 for 6 days and nights during all of its scheduled flights. The flights varied in length from 55 minutes to 4 hours and the average temperatures were found to be 57° F. The outside air temperatures at altitudes of 4,000 to 9,000 feet averaged 48° F. or about 10° F. lower.

I don't mean to say that lower temperatures will not be reached or that this data is complete. We will have to repeat the test at other times of the year and in various cargo compartments. But I do believe that the cooling effect expected by some during airplane flights, will be less than hoped for and a container should be used which will not depend on low flight temperatures in order to deliver the oysters in good condition.

The places where high temperatures are likely to be encountered are not during the actual flight, but are during the times when the packages are on the ground before being placed on the aircraft and at the end of the flight before being stored in cool rooms. Temperatures during the oyster season are usually not very high, but there are times when they do get fairly high. It appears advisable for the time being to use a shipping container which allows a margin of safety for unforeseen higher temperatures.

There are a number of good insulating materials. Some of the better known ones are cork and cork board, celotex, rock wool, balsam wool and many variations of similar materials. Many of these can be ruled out on a cost basis or difficulties of use in small containers. In addition to these, but probably lesser known, are corrugated paper boards and air corrugated paper

board has an insulating value about equal to those already mentioned and, I am told, is used as an insulator in some types of mechanical refrigerators. Containers of corrugated paper were prepared by the Hinde and Dauch Paper Company and given preliminary tests by Dr. Larsen both in the laboratory and under flight conditions. The results were good. The container consists of a corrugated board box in which the seafood is packed. The box flaps are securely closed with gummed paper and this box placed in the outer box, the two being separated by inch thick corrugated paper boards. Used in air shipments from Norfolk to Detroit, Chicago and Seattle, the oysters have risen in temperature less than $3/4^{\circ}$ F. per hour of packed time.

This container was further tested in the laboratory where temperature conditions could be controlled. Continuously recording thermometer leads were placed in various parts of the box and in two of the cans to observe the temperature rise over a 20 hour period. When the outside temperature was $70-75^{\circ}$ F., this container allowed an increase in temperature of 0.8° F. in the center of the pack and a little over 1° F. per hour in the corner can. When the outside temperature was 54° F., more nearly approximating conditions during the oyster season, the container allowed 0.4° F. per hour.

Reduced to practical working figures we would say that at outside temperatures of $70-75^{\circ}$ F. you could figure on about 1° F. rise per hour. If you chilled the oysters in cans to 35° F., it would take about 15 hours to reach 50° F. if the containers are properly packed and kept dry. If the outside temperatures are 54° F., it would take about 38 hours to reach 50° F. The container complete, weighs about 5 lbs. when made to this size which will contain 6 gallons of oysters either in gallon or pint cans. This size was chosen because it will pack well in the airplane and is about as big as can be handled easily in loading and unloading.

The other insulating material which has been considered is so called "dead air". If air is reasonably dry and is truly motionless - "dead" - it will transmit only a little over $1/2$ the heat per unit that the other insulating materials will. Actually, if you stop to analyze the reasons for these other materials being heat insulators, it will be found that a large part of their value lies in the fact that they are a collection of many small dead air spaces. Another shipping container manufacturer has decided to use this principle and has created an inexpensive container which consists of a box suspended by its corners within a larger box. Both boxes are sealed tightly to create an air space between them. Laboratory and flight tests have shown that the air space definitely has insulating value although not to the extent hoped for. Tested in air shipments, it allowed less than a degree per hour rise in temperature. In the laboratory where the outside temperature was $75-80^{\circ}$ F., it allowed 1.3° F. in the center and 1.6° F. per hour in the edge can. At 52° F. it allowed 0.7° F. per hour rise. It weighs 4.9 lbs. for the size to hold five gallons in pint cans.

Both of these containers were cut to hold oyster cans but could be built to contain fillet cans of the usual sizes. In Dr. Larsen's work, the "Insulpak" container has been used very successfully by putting a large pliofilm bag in the inner box, and filling it with fish or fillets. The bag prevents any drip from the fish getting into the container or into the aircraft.

The transport of lobsters presents a slightly different problem. Here you have the problem of keeping the lobster alive. The temperature is

possibly not quite as critical as with fish, but the lobsters must be kept moist. Various people have developed lobster shipping containers but as far as I know, the only one being used in any number, is the one I have here. It was designed to hold 50 lbs. of live lobsters. Seaweed wetted in cold seawater is placed on the bottom, the lobsters are packed in, the inner cover secured, and then the top cover is put in place. I am told that daily, several thousand pounds of lobsters are being flown from Maine to New York City.

So far, I have spoken only of the shipping container with no mention of the package in which the oysters are packed and sold. Of course, the containers commonly used now are pint and gallon sized tin cans. The majority of our work has been done with these cans because they are in use now and because most producers are equipped to handle them. But I don't believe you should overlook the possibilities offered in paper containers. I mean the type of container used by some of you who are packaging frozen oysters. It consists of a heat sealable, moisture-proof bag, which could be of cellophane or pliofilm. The bag is contained in a cardboard box of the type used for ice cream or frozen foods. This type of package would pack more solidly than cans and probably hold its temperature a little better since there is less exposed surface for heating. It is definitely a tamper-proof, consumer size package which has excellent possibilities for attractive labeling.

While on the subject of mechanizing I'd like to digress a little and repeat an idea I heard recently. As you know, the usual municipal airports are still quite a show place. Those of you who use air travel from large terminals have probably noticed the numbers of people who stand around just to watch the airplanes take off, land and unload. They are intrigued by the airplanes and are all potential consumers of seafoods - of oysters. Why not make your shipping container sufficiently attractive to catch the public's eye and suggest a seafood dinner to them? It is inexpensive advertising and at present, since the airplane is associated with speed and quality in their mind it is a good way to link your brand with these ideas.

Hotel New Yorker, N. Y. C., June 5, 1946

THE FUTURE OF FROZEN PACKAGED OYSTERS

Leo Young

The era of "Oysters R in season" during R months only is rapidly approaching an end. Frozen packaged oysters now are proving that the oyster is a 12-month food, and a good one at that.

A great upsurge in packaged food freezing and marketing came during the war years when fresh and canned fish, meats, fruits and vegetables were scarce, and transportation facilities were even scarcer. Retailers, to satisfy their customers' demands, harassed their wholesalers for supplies, and accepted packaged frozen foods when the others were not available. Consumers, rationalizing that something was better than nothing, purchased these foods reluctantly--at first. Many soon were surprised and delighted to find that frozen foods were exceptionally good--frequently better than fresh unprocessed foods--and now these satisfied customers purchase packaged frozen foods regularly. Packaged frozen oysters too have been helped by this trend.

The pinnacle of packaged frozen oyster production has neither been reached yet nor is this new marketing phase safe from complete failure. To hold the ground gained, and to move ahead to greater production and greater sales, the frozen oyster industry must do several things. First, processors must strive for ever better quality in frozen oyster packs. Second, processors and distributors must reduce the cost of frozen oysters by improving processing, packaging and distributing methods. Third, the oyster package must be used to help sell the product, and this only can be done through improved labeling.

Quality in Frozen Oyster Production

Quality in production is not attained, as some processors would think, through lip-service use of that word. Quality in production is a goal that is reached as a result of painstaking care. Quality in a product is a degree of excellence that sets it off from other products, and don't think for a moment that consumers do not know a good quality product. Buyers know good quality today, and they demand it.

To produce a good product the processor must start with excellent raw material. This means that the oysters for freezing should be carefully selected. Then they must be properly shucked, and the oyster meats should be thoroughly cleaned to remove all foreign particles. Quickly after shucking the oyster meats should go into their cellophane bags or other air-tight containers. Quick-freezing in a proper type freezer should follow immediately after packaging.

Generally speaking then, the quality of frozen packaged oysters depends upon the following: (1) selection of good-quality raw material; (2) use of suitable packaging materials; (3) employment of proper-type quick freezers; and (4) speed of operation.

Technologists of the Fish and Wildlife Service and some other government agencies are suitably qualified to recommend packaging materials, packaging

machinery and freezing equipment that should be used by frozen oyster processors. These persons as well as sales engineers representing some of the leading packaging materials and freezing equipment manufacturers should be freely consulted by processors. In that way the packaging processor can keep abreast of new developments and improvements. By quickly instituting the latest improvements the processor takes one more step toward more efficient production, and it is this efficiency in production that leads to a quality pack.

The Cost of Frozen Packaged Foods must be Reduced

The cost of frozen packaged foods today is too high. This, too, is true of the oyster pack but it does not necessarily follow that prices should be recklessly slashed. Costs can be reduced in many ways without cutting into the processors', distributors', and retailers' net profits.

First, costs can be reduced by increasing the efficiency of production. Eliminating waste during processing as well as avoiding unnecessary repairs to equipment and machinery is the first step. Competent labor and supervisory help is needed toward this end. Skilled labor should be more readily available now than at any time during the past 5 years. Processors should seek this skilled help now.

Machinery and equipment should be repaired at the first sign of trouble and worn-out parts should immediately be replaced. Processors making periodic housekeeping checkups will discover necessary repairs before they become aggravated. Repair costs can be reduced by taking immediate action.

Cost to the consumer also can be reduced by processing a more suitably-sized package. The processor should consult with his distributors and retailers in order to determine what the package weight should be. If necessary, a survey should be made of consumers to learn what their preferences are. I believe that processors will find that a 12-oz. oyster package would be more popular than a 1-lb. package--and less costly too. But whatever the weight of the package is, this weight should be decided by test rather than hit-or-miss guess. As you readily can see, a smaller weight package not only is less costly for the buyer but is used up more quickly. This means that repeat sales would be more frequent, and on the whole sales volume should be greater.

To further reduce cost shipments should be made in truckload or carload lots. Packers should study past orders from specific territories to determine if in the future it would be possible to combine orders from brokers and distributors. The shipper thus should be able to effect a saving that could be passed on to the ultimate consumer.

On the other hand the packer needs better cooperation from the railroads and trucking companies. Better refrigerated cars and trucks are needed to maintain the packaged oysters at the proper temperature. The retailer would suffer less spoilage waste if he could be the recipient of a properly refrigerated product. In the end his price to the consumer would be less, and his net profit too would be greater.

The Oyster Package must be Properly Labeled to Help Sell the Product

Frozen-food cabinets today contain a variety of products. In the majority of retail stores the frozen-food cabinet is left unattended. Patrons help

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themselves even though they frequently are at a loss as to which product to choose. How then do they decide what to buy?

First, a buyer will look for a name brand or a brand that she has previously purchased and found satisfactory. This failing, she will succumb as do the majority of purchasers to the most attractive package--to that package which has the most eye-appeal. Therefore, the cardinal point to remember when you are planning your carton design is that the carton will have to help sell the product. For that reason I suggest that you consult an expert lithographer or packaging material manufacturer. His business is design, just as yours is oyster production, and his advice could prove to be of inestimable value.

After design, comes content. By that I mean, "What should the writing on your package show"? First, it should tell what product is contained in the package. Second, the weight of the product should be written on the package as well as the suggested number of servings. This is very important to the homemaker who is going to prepare the meal, and who may be very discriminating about her preparations. Third, the label should show who packed the product and where it was packed. Consumer satisfaction with a product means repeat sales, and if the buyer learns to like your product, she will shop for it and look for it by name. Fourth, instructions should be given on the package for the proper use of the product.

It is not enough to write on the package, "Thaw and Use". The average buyer is most likely to say: "Use? But how?" Give specific instructions for use: Give recipes: The consumer-size package is sufficiently large to hold at least two recipes, and in some instances four recipes. These recipes should be explicit, and above all pre-tested. Guesswork won't do.

An attractively designed package containing all this written information should substantially account for the consumer's desire to select your product. Naturally, the quality of the product itself must be beyond criticism. The combination of good product and artistically designed informative label should make your product a leader.

Because of three things I optimistically believe that the future of frozen packaged oysters is very promising. First, the growth in the number of food stores retailing only frozen packaged products has been phenomenal in recent months. These stores differ from other food stores in that all merchandise is frozen and packed in consumer-size containers. Significantly for the oyster industry these products are advertised and sold to consumers as frozen foods from freezer cabinets. The frozen packaged oyster will find a continued demand in these stores.

Second, home delivery of frozen packaged products may become commonplace. For many years home delivery of fresh dairy products and bakery foods has been an integral phase of the marketing of these foods. Now, with the imminent large-scale advent of the home freezer and storage unit we necessarily can expect regular home delivery of all types of frozen foods, including fishery products.

Looking ahead, I visualize that the homemaker will find it convenient to order in advance by telephone or note to the deliveryman all the major frozen foods needed to feed the family for at least one week. These foods will be delivered for storage in the home freezer unit, and will be used as needed.

Thereby, the homemaker will be relieved of one chore--namely, shopping and bundle-carrying.

Delivery companies eventually should be able to deliver frozen foods at comparatively economical costs because of two factors: (1) delivery companies will suffer negligible spoilage or waste loss due to perishability, and (2) cost of delivery will be low because of infrequent, large volume deliveries.

Several companies are presently engaged in home delivery of frozen foods. Soon, many more will enter this field of activity. Fish and shellfish, such as oysters, have been tried and tested, and have been found to be exceptionally satisfactory for freezing. Frozen packaged oysters, therefore, because of economy, ease of handling and preparation, and desirability, should prove to be one of the major profitable commodities available to home delivery companies for distribution.

Third, the number of frozen-food locker plants throughout the country has increased to over 7,000 plants and branches. The average number of lockers per plant is well over 300, and the average holding capacity of lockers is about 300 pounds. The average turnover of each locker yearly is estimated to be 3 times. This means that about 2 billion pounds of food pass through locker plants yearly. Fishery products consistently have been popular with locker plant operators. Evidence for this is the assistance the locker plant industry sought of the Fish and Wildlife Service in recent years to obtain fishery products. Frozen packaged oysters were not available in the past but they are now, and locker plant operators soon will demand them.

Adding up the potentialities of these three marketing factors I believe you will agree with me that the future of frozen packaged oysters indeed looks promising.

Hotel New Yorker, N. Y. C., June 5, 1946

EXPERIMENTS AND IMPROVEMENTS IN THE MECHANICAL

DREDGING AND HANDLING OF OYSTERS

J. Richards Nelson

Our present equipment and methods of dredging oysters have changed very little in the last 50 years except for the widespread use of the Diesel engine to replace gasoline and steam. It is certainly a tribute to those persons who worked out these methods that they have endured all of these years with so little change. Dredging has been compared with the raking of leaves. You get some the first time the rake passes over an area, some more the next time and so on until you have them all. Ideally, a dredge should take all of the oysters in an area the first time. Actually, it seldom if ever does. The design and condition of the tooth bar, the type of bottom, the season of the year, the skill of the operator are all factors that determine how efficiently the dredge operates. It is my opinion that the conventional oyster dredge, properly rigged in good condition, expertly handled, will accomplish many of our harvesting and cultivating operations better than any other equipment I know of. There are other operations, such as the cleaning of ground for the elimination of drills and other enemies, in which the conventional dredge is not efficient.

One of the factors that probably most often affects the efficiency of the dredge is the tooth bar. Loose teeth, teeth bent back at the wrong angle, teeth too short for the job or perhaps too long, all contribute to inefficient operation. The Barton Oyster Dredge Bar made of tool steel with teeth that can be changed right on the job in the matter of minutes does away with any excuse for operating a dredge with poor teeth. I am planning to equip all of the dredge boats under my management with these tooth bars.

There are factors today to be contended with in the industry that did not exist at the beginning of the century. One of these is the scarcity and high cost of labor to man our boats. It is profitable today to invest a considerable amount of money in mechanical equipment to save labor, while a half century ago it was probably cheaper to do many of these jobs with manpower. The second factor is the fact that the supply of seed oysters is less today and much more costly. Every effort must be made to conserve this supply and make it go as far as possible. This puts the burden on the industry of using equipment and methods of dredging that do as little damage as possible to oysters, and that also make it possible to control our worst oyster enemies--the starfish and the drill. In this connection there are, in the writer's opinion, a number of opportunities for improving the methods that have been used for so many years.

Most of you are familiar with the suction dredge which has been developed and used successfully for oyster work and the cleaning of grounds by Messrs. Flower and Bayl's at Oyster Bay, Long Island. A somewhat different type of dredge which works on the continuous loading principle has been developed on the West coast. This is an adaptation of the dredge used in mining gold under water. Briefly, it consists of a scow, on the aft end of which is a ramp and upon this ramp, arranged so that it can be either pulled up on the scow or lowered to the bottom, is a conveyor having a wire mesh belt. On the lower

end of this conveyor is a hopper which, when lowered to the bottom, rests on rollers which are in such a position that they travel over the area from which oysters have already been taken. Impellers within this hopper are placed so that they set up a strong current which lifts the oysters and other material from the bottom onto the conveyor belt, the fine material dropping through the wire mesh and the oysters are conveyed onto the deck of the scow. The hopper is designed with a valve on the top so that there is very little interchange of water between the inside and the outside. Also, it is equipped with air tanks to control the buoyancy. The designer claims the dredge will harvest as much as 3,000 bushels per hour on a thickly planted bed. It must, however, be borne in mind that this apparatus is being operated in relatively smooth water of not over 18 feet depth and that adapting this to more open bodies of water, such as Long Island Sound and Delaware and Chesapeake Bays, would create additional problems. However, it appears that the idea has merit and may well be adopted by the industry on the Atlantic Coast, at least in some modified form, at some future time.

There are two developments designed to save labor which use the conventional method of dredging oysters but that lessen the manpower required after the dredge is brought to the boat. One is the use of a boom or booms to swing the dredge to the desired position on the vessel with a device for opening the dredge bag to allow the contents to empty at that point. Two such installations that the writer knows of are in use in the oyster industry, one by Mr. Frederick Lovejoy of East Norwalk, Connecticut and one by Frank M. Flower and Sons, Bayville, Long Island. The principle has been in use for a considerable period of time by dredgers of clams.

The other method is one which uses an idea of the writer in which the club of the dredge is strengthened and is engaged by two arms when it comes to the side of the boat and these swing upward into place and lock. The captain then releases the friction, the neck of the dredge drops to the deck and the contents empty out automatically. The friction is then again applied, raising the neck of the dredge, the catch is released and the dredge returns to the water. The original design of this was homemade and was used for a number of months on the boat "Emily Mansfield" operating out of New Haven. Much credit is due Mr. George Cadorath and Captain Eugene Cadorath of the Mansfield Oyster Company for improving the design. When this model had been developed to a point where it worked satisfactorily, Mr. Edwin S. Barton, of the Abrasive Machine Tool Company, drew designs for a greatly improved model, and the locking device was solely of his design. We are now using this equipment on the "Emily Mansfield" and the J. & J. W. Elsworth Company's boat "Captain", and a number of sets are on order for other boats. We have found that this considerably increases the boat's efficiency, cuts down the size of the crew that is required and, in addition, makes it easier for those men who remain. Two months operation of the "Emily Mansfield", an 1800-bushel boat, transplanting oysters from New Haven to Greenport, show more than a thirty per cent increase in production per dollar of operating cost. Four deck hands are carried instead of six and the loads are caught faster due to the saving in time when the dredge dumps and returns to the bottom. An additional advantage is that the boat can be used, if desired, for cleaning ground with only one or two men on deck. Where dredges had to be hand dumped, four men was the minimum deck crew.

To better accomplish the control of oyster enemies, additional steps should be taken. There should be a means of screening any desired stock in such a way that the screenings can be kept separate and disposed of for drill

control. Also, the control of starfish, particularly when they are small, can be brought about by a mechanical method of dipping the stock in either a copper sulphate or lime solution as it is caught. It is the writer's understanding that Mr. Bayles has developed such a method in connection with his suction dredge Seawanhaca.

There is no good reason why oysters cannot be conveyed from the point where they are emptied on the boat by the dredge dumper to the desired place on the boat without resorting to men and shovels. This phase is being worked on at the present time.

Under normal economic conditions the oyster must compete with a number of other foods for its part of the consumer's dollar. It is certainly to the greatest advantage of the oyster grower that we make every possible saving in the cost of production so that the cost of the finished product can be as reasonable as possible. There are great possibilities in the use of mechanical equipment and also in knowing more about the biological conditions under which oysters live. There is much that can be accomplished in this direction. All of these factors are inter-related and it is through the proper balance of these that best results can be obtained. The manufacture of the automatic dredge dumper has been turned over to a reliable company who can make the equipment for those in the industry desiring to purchase it. It is to be hoped that as additional developments come along, they will be available to the industry. We can accomplish much more by pooling our knowledge than can possibly be accomplished by any individual or group trying to gain economic advantage over their competitors by trying to monopolize any new development. Our problem is to raise the finest possible oyster at a reasonable price and do a good merchandising job, and the future of the industry will take care of itself.

Hotel New Yorker, N. Y. C., June 6, 1946

HOW CAN OYSTER SALES BE MAINTAINED WHEN MEATS AGAIN BECOME PLENTIFUL?

Albert W. Woodfield

When Dr. Radcliffe asked me to address this Oyster Convention on the subject of "How Can Oyster Sales be Maintained when Meats again Become Plentiful?", I was very reluctant to accept. You know as well as I that this is a big assignment. If I knew the solution to this problem, it would mean millions of dollars to our oyster industry.

We are nearing the end of an era of prosperity in the oyster industry such as we here may never experience again. Indeed, for my part, if we can only enjoy prosperity like this during war times, then I pray to God we may never experience it again. It is not worth the cost to this nation of ours the lives lost, in suffering and in money. Nevertheless, I firmly believe that the oyster industry could enjoy continued prosperity of a similar nature if we are willing to pool our efforts and a little money towards some constructive planning now. I am firmly convinced that there is only one practical means of maintaining prices at a level that would provide a fair return of capital investment and a reasonable living standard for those employed in the oyster industry; that would be to keep the demand for oysters equal to or in excess of production. I believe the fundamental reason why we sold oysters at a more profitable level during the past few years was primarily because the demand far exceeded the supply. Unquestionably higher incomes made it possible for the limited supply to be absorbed by a much higher price level than normal. But I rather doubt if any appreciable volume of oysters is actually purchased at prevailing war time prices simply because no other meats were available. I believe the additional profit per gallon we realized could be attributed almost entirely to the demand being greater than the supply. This is the condition we will need to duplicate during peace time.

HOW CAN THIS BE DONE? This brings me to the point where I said in the beginning that coordination of the combined efforts, talent, and capital of the oyster industry would be necessary for accomplishment of the purpose. No one individual or any small group of individuals can do this. The job to be done, is of such magnitude that the entire oyster industry should participate. And yet, if the support of the entire industry could be accomplished, the cost in comparison with the benefits to be derived would be negligible.

There are, in my opinion, three basic essentials necessary to increase the demand for oysters to a point where we could produce and sell our normal output profitably, rather than again become involved in cut-throat competition such as has existed in the past and which can be expected to resume some time in the near future. These three basic essentials are:

1. Establish closer cooperation and better understanding between members of the oyster industry.
2. Establish and maintain a reasonable uniformity of quality, grade and pack, for each principal producing area.

3. Provide for and conduct an extensive national advertising campaign.

According to the statistics on the amount of oysters that is consumed by the individual, the record shows a consumption of two and one-half pints of oysters per person in 1912, dropping to one-half pint in 1913, and rising to four-fifths pint in 1938. Although with the scarcity of meats and other merchandise, I am sure when you get the statistics from 1938 up to the present time, they will be lower than they were in 1938.

Widely scattered as the oyster industry is, there must be some central bureau where essentially necessary information and data can be assembled, compiled and then distributed to members of the industry; some central bureau which can obtain the opinions and speak for those engaged in the oyster industry; some central bureau which can conduct a national educational and advertising campaign so as to promote and encourage increased consumption of oysters. This job is entirely too big and too complicated for small local groups or associations to handle. Although these local groups or associations can and do perform desirable service on purely local problems, they do not have the time or the finances necessary to engage in a national program; even if they did, the most overall good could not be accomplished because a duplication of expense and effort would be unavoidable.

I know of no better central bureau or organization to handle this job than The Oyster Institute of North America. In the Institute we have the nucleus of a wonderful organization. I feel it has done an excellent job with the limited support and finances it has had. I feel it should have the full support of everyone engaged in the oyster industry, either directly or through their local associations. I am confident the Institute then could and would perform the desired job.

I know of no better way of promoting and increasing the sale of oysters than by a well-organized and financed national advertising campaign. We must encourage people to "EAT MORE OYSTERS" if we are to have a demand sufficient to consume peace time production at a profitable level. We must educate people to know that NOT ONLY ARE OYSTERS GOOD, BUT THAT THEY ARE ALSO GOOD FOR THEM; that they furnish in abundance the minerals and vitamins so necessary to health and vigor. We must educate them to look upon oysters as a staple, economical food, rather than a delicacy to be consumed on special occasions. Indeed, I believe there are millions who have never eaten oysters, or who have only eaten them on rare occasions. This condition should provide a most fertile field for an extensive national advertising campaign. If the meat industry, both individually and through the Meat Institute, finds it necessary to consistently advertise a product as well-known in the daily diet as meat, then I feel we should readily realize the necessity for advertising a seasonal commodity like oysters. The question is, are we willing to spend a few dollars necessary to advertise and promote the sale of oysters so we can operate at a profitable level, or do we prefer to stand idle and see our profits, and, perhaps our business, wiped out for lack of an adequate demand? We started a national advertising campaign not so many years ago, which I considered was ideal in many respects. I would like to see something similar revised at this time.

One thing certain that should increase sales is an advertising campaign which utilizes the present knowledge of the nutritional quality of oysters. There is now available a large amount of technical information regarding

oysters which can be used for this purpose and we should take advantage of the aid available from the State and Federal fishery agents, especially the U.S. Fish and Wildlife Service that has divisions on market development and education. Let us use these groups to further our own interests in selling more oysters.

And I know of no better way of keeping people eating oysters, once we have succeeded in interested them, than by consistently furnishing a wholesome and appetizing product. To accomplish this we must guard the quality and pack of our oysters. Some in the industry are already doing this but many others are not. We must remember that the people that buy oysters are no different from you or me. If we furnish a good, wholesome product, they will surely eat more oysters. On the other hand, if we furnish a poor, tasteless product, then no matter how much advertising or sales talk we use, it will never increase the demand or consumption to a level that would be profitable. We cannot expect to get people to eat more oysters unless we can show and convince them that oysters are good as well as good for them. This is about the only thing that we can accomplish individually toward increasing consumption.

It is unfortunate, however, that the attractiveness of war profits blind many producers to the necessity of furnishing quality oysters. Furthermore, there was an influx of amateurs brought into the business by financial attractions. These newcomers were not always aware of inherent difficulties in the production of wholesome oysters. As a result, the entire oyster industry must suffer unless it can remedy the situation.

The emphasis of quantity rather than quality production led to the appearance on the market of a large number of "poor" oysters. These were "poor" for a number of reasons. Some were not in prime condition from the outset, having been taken from areas where the oyster had no opportunity to develop properly. Others, in fair condition at the outset, were ruined by excessive washing and blowing in order to obtain a gallon containing as few oysters as possible. Such oysters were lacking in flavor and appearance, and were subject to spoilage quicker. The haste in getting these to the consumer led to slipshod methods of handling and refrigerating, and as a result, the consumer received an oyster which he ate out of necessity but with no genuine pleasure. Such products merely enhanced the desire for meat.

Many retailers are responsible for poor quality, and in many cases, ruined perfectly good oysters by their trade practices. It is not necessary to review these here but you are all aware of the mishandling many oysters receive in retail establishments. Such mishandling has not assisted the industry in maintaining its war-time outlets for oysters.

There is only one way to offset any unfavorable reaction which may exist at present, and that is by furnishing the consumer with first-grade oysters and by maintaining quality standards. Shucked oysters must be free of mud and dirt, properly handled and packed, and delivered to the ultimate consumer in good condition in consumer containers. Through a properly designed and conducted publicity campaign, the public must be made aware of the fact that oysters are a wholesome, safe food. The industry must take steps to insure this fact to guarantee the quality of oysters offered for sale.

But, in addition, new consumers must be attracted to the oyster industry, and one of the most promising commodities for expanding the current market is

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the frozen oyster. Freezing makes the oyster a year-round food and not a seasonal delicacy. More information is required regarding best methods of handling frozen oysters. But most of the difficulties will be overcome in the near future.

The second thing that is greatly needed is more consumer information especially for people in areas where oysters are still a novelty. This is especially true in case of frozen oysters.

In addition, if packages were made more attractive, this would greatly assist in our sales program. The finest oysters in the world offered to consumer in a poor or unattractive package will not have the sales appeal of an inferior product in a dressed-up container. The use of an attractive, tamper-proof, single service container for fresh oysters will help sales considerably.

Finally, the success of our efforts to maintain and expand our markets depends upon the desire of the oyster producers to keep faith with the consumer. As long as we conscientiously strive to supply the market with first-class merchandise and not sacrifice quality for temporary gains, financial or otherwise, we should be able to meet the competition offered by the meat and other food industries.

In conclusion, may I remind you of what I said in the beginning, I am no expert authority. I admit that I do not know the answer; I wish I did, but, nevertheless, I sincerely hope that I have succeeded in presenting some worthwhile suggestions for your consideration. If I have succeeded in doing this, then I hope that we in the oyster industry will make it a point to get together, exchange ideas, and then develop a program for increasing the sale of oysters. Frankly, I am convinced that the only possible way that we can hope to maintain oyster sales in competition with other meats during the post-war period just ahead, and at a profitable level to the industry, is by:

First, closer cooperation between members of the oyster industry;

Second, improving the over-all quality, grade and pack of oysters;

And third, provide for and conduct an extensive national advertising campaign.

Hotel New Yorker, N. Y. C., June 6, 1946

INCREASING CONSUMERS' INTEREST IN OYSTERS

Mrs. Frances Foley Gannon

I feel a bit hesitant about addressing you oystermen at your Annual Joint Convention. As you undoubtedly know, my usual job is talking directly to consumers, and I am now, I might say, on the other side of the fence.

But, I am glad of the opportunity because this fence between has a gate right in the middle of it, and that gate swings both ways. Consumers are opening it pretty regularly these days to reach over to your side of the fence to find out what's going on over there. They come to ask questions about your products. The war days made them conscious, as never before, of food, and their interest has likewise widened in shellfish. In your planning during this Convention period you should not overlook the fact that the food situation brings you a golden opportunity to give facts and win consumers' confidence in both your industry and your products. All of us are proud, too, of the skill and enterprise of our American fish industry, and you can win a high place in the regard of consumers of America - a regard which they can build today and keep through tomorrow.

For it is not food alone, but the right food, that consumers are interested in, and shellfish has a place among the seven basic foods recommended by the Nutrition Program to sustain good living for our millions of young and old. Emphasis on oysters as one of the basic foods is an excellent way to increase consumer interest in your product. To do this, of course, there are several questions which consumers want to have answered about oysters as they do about all products.

The housewife, for example, wants to know: How does it fill a place on the balanced menu? What does it have that other foods lack and that makes it important to serve? What about its quality and care? Is it economical? Does the preparation involve much trouble? All these are questions which we meet with frequently. And they are questions that you can answer. These questions should be circulated by the industry through a wide distribution of educational material as well as through demonstration cookery, if you want people to eat and enjoy more oysters.

From all this you can see that we are interested in oysters and some of you may want to know why. My own reason might be a personal one. If I never liked oysters before - but I assure you I really always have - I certainly would have developed a real taste for them after having been a guest, on many occasions, at the lunches and dinners of the Oyster Growers. And so I feel that if everyone had the opportunity of eating fine quality, well-prepared oysters, it would be difficult to keep up with the demand for them.

As Director of Consumers' Service of the Department of Markets, I am particularly interested in the distribution of plentiful, economical, and seasonal foods and in advising the consumer of these facts, as well as the food values of the various commodities, and the many ways in which food can be prepared. As foods come into their season, it becomes my job to call them to the attention of the city's housewives.

From the very beginning of my radio talks right through to the present time, we have not neglected the oyster when "Oysters R in Season". Time and again we have stressed that "The Oyster" like other products of the sea takes first rank on the nutritional chart, and that "The Oyster" of all shellfish is generally rated as the most important from a nutritional standpoint. For generations this succulent bivalve has been prized as an appetizing food. But, it has only been in the last decade or so that we are really appreciating the oyster's contribution to the maintenance of good health.

We have tempted consumers to eat oysters by suggesting that they try an oyster stew and then giving them a good recipe. We have suggested other dishes, such as Oyster Fries, Oyster Shortcake, Baked and Escalloped Oysters, and Canapes.

We have also stressed the buying and care of oysters, not only through our radio talks but through the distribution of our Shellfish Booklet, which is temporarily out of print. I might here say it is one of our most popular recipe booklets and before the war days traveled to ports and little islands in the Pacific that were considered remote then.

Our cooking demonstrations are where we do an excellent job. If we haven't changed people's eating habits, we have broadened them. Our experience has shown us that many foods are not included in the family menu, although often eaten out, because people do not know how to buy the food or even know how to prepare it. When it is made familiar to them at the schools, when they see it handled and prepared, ask questions about it, too, and then get the aroma of the cooking or the delicacy of its flavor in the raw state, the result is generally a repeat of the day's menu in the women's homes at night.

In this way, we have tried to make housewives think of oysters more as part of their general family meal, rather than as a food just for their company or dress-up dinner. But they often hold up to us the difficulty they encounter with unshucked oysters and also the comparatively high price that they pay for oysters.

Here, I think, the industry could do much to simplify the buying of, let's say, oysters on the half shell through convenient packaging which would make the serving a joy and not a problem. And, if oysters are to compete with other every-day foods, the industry will need to study the problem of bringing prices within the reasonable range, or stimulate the buying of oysters through bargain days.

What has happened to the oyster bars that were so popular years ago? They could do much to promote consumer interest.

I leave these thoughts with you in the hope that the experience which we have gained in Markets will prove of some help in your efforts to increase the consumption of fine quality oysters. The Department of Market's concern is the distribution of food for the well-being of over eleven million people of the Metropolitan area, and the Department welcomes industries whose objective is the distribution of good quality food.

I am going back now to my side of the fence and through that gate which I mentioned earlier in my talk. Let it always swing both ways so that we can have a continuing interchange of ideas and suggestions in this matter of eating good oysters.

THE OYSTER INSTITUTE OF NORTH AMERICA

Convention Address, Hotel New Yorker, New York

June 6, 1946

RESULTS OF RECENT RESEARCHES ON THE FOOD VALUE AND BACTERIOLOGY OF OYSTERS

by J. M. Lemon, Chief, Technological Section,
Division of Commercial Fisheries, Fish and Wildlife Service,
Department of the Interior

At the beginning of the war in 1941 there were several nutrition problems dealing with oysters under way. Some of these problems were discontinued due to the length of time required to complete them. Others which were further advanced were carried to completion. Those changes in the program were made necessary due to the fact that problems having a more direct bearing on the prosecution of the war required solution and it was impossible to obtain additional personnel to undertake those of less essentiality. A number of problems in nutrition of oysters were completed during the period from 1942 to 1945 but due to the pressure of the work at the laboratories analyses of the data and compilation of the reports of the work were not undertaken until the close of the war last year. As a result in the near future these reports will begin appearing in a complete form in the Commercial Fisheries Review and as Technological Research Reports.

Last year it also was possible to resume some of those problems which were dropped early in the war and while the data at present on these are insufficient to warrant conclusions I will review them to the extent that they may be indicative of the final results. Advantage also is taken of this opportunity to present a resume of the entire research program in which oysters are being given consideration.

Earlier studies of technological staffs of this Service have shown that the protein of the oyster is of excellent nutritive quality. Some further work at present is being done to determine more specifically the biological value, the digestibility and the effect of cooking on the nutritive value of oyster protein. The preliminary results confirm those reported in the earlier work, and experiments are now in progress to acquire enough data for a complete significant report covering these three pertinent points. In the preliminary studies conducted to determine the rate of digestion rather than the completeness of digestion of oyster proteins, fasting laboratory animals were fed freshly shucked oysters and the exact amount eaten in one-half hour was recorded. The animals were then killed at intervals ranging from one to six hours and the stomach and small intestines were dissected and the contents analyzed. The data show that most of the oyster protein disappears from the stomach and the small intestines during the first one to 1½ hours. Only a very small residual amount remains at the end of 6 hours. While comparable data for other types of protein foods are not at present available, it appears that the digestion of the protein of the oyster is quite rapid, and complete. This fact has been generally assumed in the past, the completion of this work will lend factual evidence based on scientific research to confirm the assumption.

Some vitamin assays have been conducted to determine the range in values of vitamin A, thiamine, and riboflavin in oysters from various sections of the Atlantic and Gulf Coasts, and in oysters which have been subjected to different methods of handling in the shucking operations, such as prolonged washing and blowing and variations between prolonged and extremely short blowing and washing periods.

Some of these data were submitted to you in a report at your convention in Philadelphia four years ago. The remainder will be summarized when additional confirmative work has been completed. The results on this latter work have not been completed to a point where it is possible to draw definite conclusions. In the cooking experiments which have been conducted thus far the indications are that approximately 2/5ths reduction of the thiamine content of oysters results when they are baked. There is a similar reduction in thiamine content of oysters which were simmered. However, in this case the thiamine was transferred from the oysters to the cooking liquor and would therefore be available for use when stews are prepared. The riboflavin content has been found to be relatively unaffected by cooking by any of the now known methods.

A cooperative project is now being conducted with the College of Home Economics at the University of Maryland in which several girl students are being served a shellfish dish including oysters or a fish dish during the noon luncheon for a six weeks period. The exact quantity of nutrients supplied by the fishery products will be determined in relation to the daily total food intake. Blood samples are being taken weekly to determine if there is any change in the red blood cell count when fishery products are included in a mixed diet. This problem has been under consideration only a short period of time and it is not possible as yet to indicate any results.

It may be of interest to you to know what nutrient factors are contained in a portion of raw oysters, that is, 6 oysters weighing approximately 3 1/2 ounces. These are:

Calories .	60		
Protein	6.5	grams	
Fat	1.6	"	
Glycogen	4.2	"	
Calcium	58	milli	grams
Phosphorus	112	"	"
Iron	6.1	"	"
Copper	3.7	"	"
Iodine	0.05	"	"
Vitamin A	375	international	units
Vitamin D	5	"	"

Thiamine	0.18 milli grams		
Riboflavin	0.22	"	"
Nicotinic acid	1.2	"	"
Ascorbic acid	3	"	"
Inositol	44	"	"
Folic acid	0.25	"	"
Pgndoxine	33	micro grams	
Biotin	9	"	"

There also are undoubtedly several other nutrients for which assays have not yet been made. These average data indicate that a serving of oysters will supply more than the daily allowance of iron and copper, and about 1/2 of the iodine needed. It will also supply about 1/10 of the needed protein, calcium, phosphorus, vitamin A, thiamine, riboflavin, and nicotinic acid. The recommended daily allowances for some of the other nutrients have not yet been promulgated.

Oysters seem to be one of the most thoroughly investigated of all food elements used in the human diet. Not only have many investigations been made into the nutritive value of oyster meats but within the last 2 or 3 years much more interest has been shown in the utilization of shells for poultry feeding than ever before. A number of feeding studies with poultry have been conducted recently at State experimental stations. One of the advantages of oyster shells as recognized in poultry feeding is that they represent a naturally standardized product which can safely be assumed to contain 95 to 98 percent of calcium carbonate. On the other hand limestone which has occasionally been used in chicken grits is a highly variable product, even varying greatly from the same quarry, and requires a close check of its calcium and magnesium content when used for poultry feeding. It has been found in these recent studies that groups of birds which received oyster shells averaged 20 more eggs per laying period per bird than those which received dolomitic magnesia limestone grit (80 percent calcium carbonate) and 42 more eggs per laying period than those which received no calcium carbonate supplement for egg shell production. This has resulted in the conclusion that crushed oyster shells are the best source of grit for poultry feed. It can therefore be seen that oyster shells have a very considerable economic value.

In March, 1945, a packaging experiment with fresh and frozen oysters was begun at the College Park Laboratory. Since very little information was available on the bacteriology of frozen sea food it was decided that routine bacteriological examinations should be made at the same time the taste tests, free liquor, and pH determinations were made. Samples of untreated shucked oysters, and brine dipped oysters were examined before the packaging and freezing operations. Samples of frozen oysters packaged in several types of containers were examined at various intervals during the following twelve months.

Although the project did not offer ideal conditions under which to carry on bacteriological studies it did furnish the basis for a few general

1. The first part of the document is a letter from the President of the United States to the Congress, dated January 3, 1862. It is a very long letter, and it contains a great deal of information about the state of the country at that time. The President talks about the war with Mexico, and about the situation in the South. He also talks about the economy, and about the need for more money. He ends the letter by saying that he is very proud to be the President of the United States, and that he will do his best to serve the people.

2. The second part of the document is a letter from the Secretary of the Treasury to the Congress, dated January 3, 1862. It is a very long letter, and it contains a great deal of information about the state of the Treasury at that time. The Secretary talks about the war with Mexico, and about the situation in the South. He also talks about the economy, and about the need for more money. He ends the letter by saying that he is very proud to be the Secretary of the Treasury, and that he will do his best to serve the people.

3. The third part of the document is a letter from the Secretary of the Interior to the Congress, dated January 3, 1862. It is a very long letter, and it contains a great deal of information about the state of the Interior at that time. The Secretary talks about the war with Mexico, and about the situation in the South. He also talks about the economy, and about the need for more money. He ends the letter by saying that he is very proud to be the Secretary of the Interior, and that he will do his best to serve the people.

4. The fourth part of the document is a letter from the Secretary of the Navy to the Congress, dated January 3, 1862. It is a very long letter, and it contains a great deal of information about the state of the Navy at that time. The Secretary talks about the war with Mexico, and about the situation in the South. He also talks about the economy, and about the need for more money. He ends the letter by saying that he is very proud to be the Secretary of the Navy, and that he will do his best to serve the people.

5. The fifth part of the document is a letter from the Secretary of the War to the Congress, dated January 3, 1862. It is a very long letter, and it contains a great deal of information about the state of the War at that time. The Secretary talks about the war with Mexico, and about the situation in the South. He also talks about the economy, and about the need for more money. He ends the letter by saying that he is very proud to be the Secretary of the War, and that he will do his best to serve the people.

conclusions. It can be said that the freezing operation considerably reduced the total numbers of bacteria present and the decline continued through the first three or four months of storage. During the next eight months the total counts generally remained at a low level. There is also some indication that brine dipping further depresses the total counts. Coliform organisms were not eliminated by freezing but their numbers were reduced.

In December 1945 two samples of frozen oysters were tested to determine whether or not there was a significant difference in bacterial content of oysters thawed at room temperature and oysters thawed in crushed ice. Both the total number of bacteria present and the most probable number of coliform organisms were much higher for the sample thawed at room temperature. On the basis of this it would seem advisable to recommend that retailers hold frozen oysters in crushed ice prior to selling.

In February 1946 two samples of an experimental pack of frozen oysters produced by a Maryland sea food dealer were examined to see if they compared favorably with oysters frozen in this laboratory. These oysters were found to contain Salmonella of the food poisoning type. Seven other samples of this same pack were obtained for examination and these also were found to contain Salmonella. On the basis of these results it is suggested that packers preparing oysters for freezing assure themselves that the plant is kept thoroughly clean during the operation.

Studies have been made of "wet storage" of oysters in Chincoteague Bay. These were made in cooperation with the States of Virginia and Maryland. The waters of the Bay in areas where wet storage is practiced were shown to be free of fecal pollution by bacteriological tests.

The practice of placing oysters on floats for wet storage in clean waters of high salinity has at least two advantages. It permits the shellfish to become free of mud and other debris and at the same time permits the dealers to maintain a constant supply of marketable oysters, regardless of weather.

During the months of November and December 1945 members of the Technological staff devoted a considerable portion of their time to a survey for the purpose of obtaining bacterial data as to the drip or bleeding of freshly shucked oysters. The measurements were made on oysters handled by the general routine method employed in the plants visited. In some of these the oysters were washed and blown in fresh water for a considerable period of time. In others the washing and blowing operation was held to a minimum. In some of the Gulf plants visited there was no washing or blowing but the oysters were flumed from the shuckers to the packing room and remained in fresh water less than 5 minutes. The results obtained in this survey indicate that the bleeding or drip of freshly shucked oysters varies over a wide range depending on the area from which the oysters are harvested. In some of the Gulf plants it was found that the oysters would exude liquor to approximately 20 percent where they had not been washed or blown in fresh water, while in the New England plants when the washing and blowing operation had been for a period of as long as 15 minutes the quantity of drip was only 1 percent or less, and at intermediate points the results fell between these two extremes. This indicates that a measurement of the liquor exuded from freshly shucked oysters from the washing and blowing operation can not be considered as an indication of whether or not water has been added to the market oysters.

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And finally there are several extensive researches into the problem of bacterial indices of pollution under consideration. A new medium has been developed for detecting fecal streptococci which shows considerable promise because these organisms are more specific for fecal pollution than those now employed in routine tests.

If this method becomes generally accepted it will eliminate to a considerable extent the former conception that any water showing *E. coli* is contaminated with sewage. All of these problems will be continued to completion during the next year if funds are available.

Hotel New Yorker, N. Y. C., June 6, 1946

CONTROL OF PLANT SANITATION BY INDUSTRY

G. Clifford Byrd

When one talks about oysters, usually the word "bed" follows in our minds. Beds are very important factors in New York right now. However, instead of the word "bed", substitute the word "field" in connection with oysters. When one thinks of the oyster business as a field, a sphere of action, as a game which one enters, one becomes subject at once to the rules. When one is able to work with the rules and use them intelligently for an attainment of one's needs in the business, one may have been said to have reorganized the field.

Plant sanitation is one of the many responsibilities accepted by managers and owners upon entering the oyster field or industry. The oyster industry, as well as other food processing industries, is controlled by laws of requirements and standards made by the Federal Government and States. The oyster industry today enjoys an enviable position among other food industries with the enforcement agencies. This was not so years ago. There have been decided improvements made by the industry in recent years, and today there is better understanding between the State and Government agencies and the oyster industry than was dreamed possible five or ten years ago. Such a condition has been made possible by the willingness and patience of the oyster industry and the enforcement agencies to understand one another's problems. Credit is also due to such organizations as The Oyster Institute of North America, The Oyster Growers and Dealers Association, the National Shellfisheries Association, and the Fish and Wildlife Service. As it is an established fact that plant sanitation is the oyster industry's responsibility, with valuable assistance available by such organizations, there can be no excuse for lack of knowledge, carelessness, and indifference in processing this food product.

A bacteriologist knows what is meant by sanitation; many oyster producers understand the required standards of sanitation and follow its laws. Yet the small packer entering the business without previous experience or knowledge of bacteriology, or with a quick money-making motive, does not immediately grasp the significance of the words "bacteria" and "sanitation". Plant sanitation and bacteria mean to this packer something to force him out of his livelihood. He does not realize that these same Governmental agencies are protecting him when he buys other processed foods. Yet he accepted this responsibility when he entered the field or business of producing oysters for near and distant markets. It has been found that this type of producer does not have as his primary thought that he is handling food for people to eat. He does not attend meetings, conventions, or hearings, where he can learn more about oysters than he could possibly imagine existed. On the other hand, this type of producer feels that he has accomplished much when he has been able to evade a situation with the health authorities, not realizing that with the laboratory the health officer can tell the packer what he has or has not done in regard to proper processing the oysters and completely sterilizing all utensils used. As an example of conditions met in the field, a State Inspector, making an inspection, was informed that all equipment had been steam sterilized daily since the beginning of the oyster season. There was evidence that this might be incorrect, so the Inspector advised the manager he would check the steaming equipment. An employee lighted the fire, already laid in the boiler.



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